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1927/28

Lehigh University Publication

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REGISTER, 1927-1928

ANNOUNCEMENT, 1928-1929

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1927

JULY

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1928

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1929

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UNIVERSITY CALENDAR

1927–1928

1927

Sept. 8, 9, 10, 12 (Thurs.-Mon.)	Examinations for admission
Sept. 13, 14, 15, 16, 17 (Tues.-Sat.)	Freshman Week
Sept. 13, 14, 15, 16, 17 (Tues.-Sat.)	Fall re-examinations
Sept. 14, 3:30 p.m. (Wed.)	First Faculty meeting
Sept. 19, 20, 21 (Mon., Tues., Wed.)	Registration days
Sept. 21, 3:30 p.m. (Wed.)	**First Semester begins**
Oct. 3 (Mon.)	Last day for undergraduate registration
Oct. 5 (Wed.)	Founder's Day (holiday)
Nov. 17 (Thurs.)	Mid-semester reports
Nov. 19 (Sat.)	Lafayette game (holiday)
Nov. 23, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Nov. 28, 7:45 a.m. (Mon.)	Thanksgiving holidays end
Dec. 21, 4:00 p.m. (Wed.)	Christmas holidays begin

1928

Jan. 5, 7:45 a.m. (Thurs.)	Christmas holidays end
Jan. 21, 12:00 m. (Sat.)	Instruction ends
Jan. 23, 8:00 a.m. (Mon.)	Examinations begin
Feb. 1, 6:00 p.m. (Wed.)	**Examinations end**
Feb. 3, 4 (Fri., Sat.)	Registration days
Feb. 6, 7:45 a.m. (Mon.)	**Second Semester begins**
Feb. 22 (Wed., Washington's Birthday, Mid-winter Alumni Day)	Public Speaking Contest
April 4, 4:00 p.m. (Wed.)	Easter holidays begin
April 5 (Thurs.)	Mid-semester reports
April 12, 7:45 a.m. (Thurs.)	Easter holidays end
May 23, 12:00 m. (Wed.)	Instruction ends
May 24, 8:00 a.m. (Thurs.)	Examinations begin
June 2, 6:00 p.m. (Sat.)	**Examinations end**
June 7, 8 (Thurs., Fri.)	Senior re-examinations
June 9 (Sat.)	Alumni Day
June 10 (Sun.)	Baccalaureate Sunday
June 11 (Mon.)	Class Day
June 12 (Tues.)	**University Day**
June 13, 14, 15, 16 (Wed.-Sat.)	Examinations for admission
July 5 (Thurs.)	Summer Session begins
Aug. 15 (Wed.)	Summer Session ends

1928–1929

1928

Sept. 6, 7, 8, 10 (Thurs.-Mon.)	Examinations for admission
Sept. 11, 12, 13, 14, 15 (Tues.-Sat.)	Freshman Week
Sept. 12, 3:30 p.m. (Wed.)	First Faculty meeting
Sept. 17, 18, 19 (Mon., Tues., Wed.)	Registration days

UNIVERSITY CALENDAR—Continued

Sept. 19, 3:30 p.m. (Wed.)	**First Semester begins**
Oct. 1 (Mon.)	Last day for undergraduate registration
Oct. 3 (Wed.)	Founder's Day (holiday)
Nov. 15 (Thurs.)	Mid-semester reports
Nov. 24 (Sat.)	Lafayette game (holiday)
Nov. 28, 4:00 p.m. (Wed.)	Thanksgiving holidays begin
Dec. 3, 7:45 a.m. (Mon.)	Thanksgiving holidays end
Dec. 19, 4:00 p.m. (Wed.)	Christmas holidays begin

1929

Jan. 3, 7:45 a.m. (Thurs.)	Christmas holidays end
Jan. 19, 12:00 m. (Sat.)	Instruction ends
Jan. 21, 8:00 a.m. (Mon.)	Examinations begin
Jan. 30, 6:00 p.m. (Wed.)	**Examinations end**
Feb. 1, 2 (Fri., Sat.)	Registration days
Feb. 4, 7:45 a.m. (Mon.)	**Second Semester begins**
Feb. 22 (Fri., Washington's Birthday)	Public Speaking Contest
March 27, 4:00 p.m. (Wed.)	Easter holidays begin
March 28 (Thurs.)	Mid-semester reports
April 4, 7:45 a.m. (Thurs.)	Easter holidays end
May 22, 12:00 m. (Wed.)	Instruction ends
May 23, 8:00 a.m. (Thurs.)	Examinations begin
June 1, 6:00 p.m. (Sat.)	**Examinations end**
June 6, 7 (Thurs., Fri.)	Senior re-examinations
June 8 (Sat.)	Alumni Day
June 9 (Sun.)	Baccalaureate Sunday
June 10 (Mon.)	Class Day
June 11 (Tues.)	**University Day**
June 12, 13, 14, 15 (Wed.-Sat.)	Examinations for admission

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EDWIN J. PRINDLE, M.E., LL.B., LL.M.
Lecturer on Patent Law

WINTHROP O. HEARSEY, M.E.
Lecturer on Industrial Transportation

ROY A. LEWIS, M.E.
Lecturer on Plant Management

THADDEUS MERRIMAN, C.E.
Lecturer on Hydraulic Engineering and Water Supply

NORMAN G. REINICKER, M.E.
Lecturer on Power Plant Engineering

ARTHUR WEST, B.S., M.E.
Lecturer on the Design of Internal Combustion Engines

WILLIAM BOWIE, B.S., C.E., M.A., SC.D.
Lecturer on Isostasy and Geodesy

HENRY I. KLOPP, M.D.
Lecturer on Mental Hygiene

INSTRUCTORS

MORRIS EUGENE KANALY
Instructor in Physical Education

ARTHUR GIBBS CRAFTS, A.B.
Instructor in Physics

JAMES SHEPARD WEBB, B.S.
Instructor in Physics

JUDSON GRAY SMULL, B.S., M.S.
Instructor in Chemistry

WAYLAND SOLON BAILEY, S.B.
Instructor in Mechanical Engineering

CYRIL DEWEY JENSEN, B.S. IN C.E.
Instructor in Civil Engineering

JOHN PHILIP KARBLER, B.SC., M.A.
Instructor in Physics

EDWARD YAGER LINDSAY, A.B., A.M
Instructor in Latin

HARRIS CARY PALMER, B.A., M.A.
Instructor in Physics

RAFAEL ARCANGEL SOTO, B.S., B.A., M.A.
Instructor in Romance Languages

HOMER GARRISON PFANDER, A.B., M.A.
Instructor in English

FAYETTE CURTIS ANDERSON, B.S.
Instructor in Electrical Engineering

MEREDITH FREDERIC BURRILL, A.B., A.M.
Instructor in Geology

ARCHIBALD EDMUND GRAY, B.S., M.S., PH.D.
Instructor in Chemistry

BURGESS HILL JENNINGS, B.ENG.
Instructor in Mechanical Engineering

FRIEDRICH OTTO KEGEL, A.M.
Instructor in German

MAURICE BERT LEVY, Met.E.
Instructor in Metallurgy

ALEXANDER WALKER LUCE, B.S., M.E.
Instructor in Mechanical Engineering

MAX MEENES, A.B., M.A., Ph.D.
Instructor in Experimental Psychology

LOUIS JOHN PARADISO, B.S., M.A.
Instructor in Mathematics

HOWARD GARRETT RHOADS, B.A., M.A.
Instructor in English

GEORGE WESLEY RIDDLE, B.A., M.A.
Instructor in Mathematics

JOSEPH HERMAN TAGGART, Ph.B.
Instructor in Economics

JOSEPH MAX ANDRESS, B.S. in E.E.
Instructor in Electrical Engineering

FRANK CHESTER BECKER, A.B.
Instructor in Psychology

WILLIAM BENDER, B.A., M.S.
Instructor in Physics

HUGH CARLTON BLODGETT, A.B., Ph.D.
Instructor in Psychology

ARTHUR RICHARD BRAUNLICH, jr., A.B., A.M.
Instructor in English

FERDINAND HINCKLEY BUTT, A.B., M.A.
Instructor in English

JOHN CHARLES CLARK, A.B., M.S.
Instructor in Physics

ROBERT C. DICKSON, B.A., M.A.
Instructor in English

FRANK LEO FENTON, A.B., M.A.
Instructor in English

WILLIAMS BASSETT GETCHELL, JR., B.S. IN C.E.
Instructor in Civil Engineering

THOMAS HUGER HAZLEHURST, JR., A.B., PH.D.
Instructor in Chemistry

CURTIS DANIEL MACDOUGALL, A.B., M.S.
Instructor in Journalism

ELLIOTT LEE McMILLEN, B.S. IN CH.E., M.S.
Instructor in Chemical Engineering

CARLETON FRANCIS MAYLOTT, B.S. IN E.E.
Instructor in Electrical Engineering

CHARLES HENRY MORHOUSE, PH.B., M.S.
Instructor in Biology

ROBERT BEVERLY MORRIS, B.S. IN C.E.
Instructor in Civil Engineering

LOUIS ARTHUR PARDUE, A.B., M.S.
Instructor in Physics

ARTHUR ROSE, B.A., M.A., PH.D.
Instructor in Chemistry

FREDERIC LAMOTTE SANTEE, A.B., B.A. (Oxon.)
Instructor in Latin

DAVID GALLUP SCOTT, B.A., M.A.
Instructor in Romance Languages

JONATHAN BURKE SEVERS, A.B., A.M.
Instructor in English

FRANKLIN McCOWN THOMPSON, A.B., M.A.
Instructor in Romance Languages

LAUREL H. TURK, A.B., M.A.
Instructor in Romance Languages

WILLIAM HERBERT WITHERS, B.A.
Instructor in Economics

ASSISTANTS

THOMAS JOSEPH LAVIN, Staff Sergt. of Inf., U. S. A.
Assistant in Military Science and Tactics

FRED JOHN MOHRING, Tech. Sergt., U. S. A.
Assistant in Military Science and Tactics

HERBERT J. NEWCOMB, Sergt. of Inf., U. S. A.
Assistant in Military Science and Tactics

WILLIAM LEVI KICHLINE, B.A.
Assistant in Mathematics

LELAND SPENCER BARNES, A.B.
Assistant in Mathematics and Astronomy

WALTER ROBERTS COUCH, C.E., M.S. in Educ.
Assistant in Physics

CARL HAROLD NORDSTROM, B.S.
Graduate Assistant in Mathematics

CARLTON ERNEST BROWN, Ch.E.
Assistant is Chemistry

HALTON HOBSON FRIEND, B.S.
Graduate Assistant in Physics

RUSSELL WIEDER GILBERT, A.B.
Assistant in German

MAURICE SVEN GJESDAHL, B.S.
Graduate Assistant in Mechanical Engineering

JAMES MAHONEY
Assistant in Swimming

FREDERIC ALLEN SCOTT, B.S.
Graduate Assistant in Physics

WILLIAM JOSEPH SETTE, B.S.
Graduate Assistant in Physics

WAYNE TREBER SPROULL, B.S.
Graduate Assistant in Physics

JOHN MURRAY THOMPSON, A.B.
Graduate Assistant in Mathematics

PAUL CHRISTIAN WETTERAU, CH.E., M.S.
Assistant in Chemistry

HAROLD PHILIP WHITENIGHT, B.S.
Assistant in Chemistry

FELLOWS

WALTER SERINUS EGGE, B.S. IN CHEM.
New Jersey Zinc Company Research Fellow

CHARLES WELLINGTON SIMMONS, B.SC.
H. M. Byllesby Research Fellow

MELVIN ALEXANDER THORPE, B.CHEM.
H. M. Byllesby Research Fellow

RICHARD JOHN DEGRAY, Ch.E.
Student Chemistry Foundation Fellow

HUGH CLIFFORD JONES, CH.E.
Student Chemistry Foundation Fellow

ARTHUR ROSE, B.A., M.A., PH.D.
Columbian Carbon Research Fellow

ERICH KARL ZIMMERMAN, CH.E.
Pfister and Vogel Leather Company Research Fellow

WILLIAM WALTON KITTELBERGER, CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

SAMUEL CRAIG NEVINS, CH.E.
Archer-Daniels-Midland Company and William O. Goodrich Company Research Fellow

COMMITTEES OF THE FACULTY

(The term of each member expires in June of the year given in parenthesis after his name)

Admissions: Dean McConn *(ex officio)*, Professors Luch, (1928), Hughes (1929), Reynolds (1930), Anderson (1931), Assistant Dean Curtis (1932), Becker (1933), Fox (1934).

Advanced Standing: Dean McConn *(ex officio)*, Professors Wright (1928), Smith (1929), Turner (1930), Bidwell (1931).

Athletics (faculty members of the Board of Control of Athletics): Professors Reiter *(ex officio)*, Larkin (1928), More (1929), Ogburn (1930).

Chapel: Professor Esty (1928), Mr. Trafford (1929), Professors Ogburn (1930), Babasinian (1931), Picard (1932).

Discipline: Dean McConn *(ex officio)*, Professors Stocker (1928), Palmer (1929), Cowin (1930).

Educational Policy*:* President Richards *(ex officio)*, Professor Fogg (1928), Babasinian (1929), Hall (1930), Larkin (1931), Vice-President Emery (1932).

Faculty Educational Club: Vice-President Emery, Librarian Leach, Professors Butterfield, Hughes, Reynolds, Sinkinson.

Honorary Degrees: President Richards *(ex officio)*, Professors Ullmann (1928), Butterfield (1929), Goodwin (1930), Ogburn (1931), Librarian Leach (1932), Professor Gipson (1933).

House Committee, Drown Hall: Professor Anderson (1928), and two student members: Messrs. J. C. Morrison, G. W. Fearnside, Jr.

Inspection Trips: Professors Butterfield (1928), Chamberlin (1929), Seyfert† (1930), Payrow (1931), Wilson (1932).

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† Absent on leave, Professor Gruber serving.

Lectures: VICE-PRESIDENT EMERY (1928), PROFESSOR GIPSON 1928), LIBRARIAN LEACH (1928), PROFESSORS S. M. BROWN (1929), BULL (1929), FOGG (1929).

Library: PRESIDENT RICHARDS *(ex officio)*, LIBRARIAN LEACH *(ex officio)*, PROFESSORS CAROTHERS (1928), FOX (1929), ULLMANN (1930), R. W. HALL (1931).

Petitions: DEAN MCCONN *(ex officio)*, PROFESSORS GRUBER (1928), BUTTS (1929).

Publications, Board of: DEAN MCCONN *(ex officio)*, PROFESSORS FRETZ (1928), RILEY (1929), and three student members: MESSRS. W. H. DORSEY, D. R. WILSON, G. SPALDING.

Roster: ASSISTANT DEAN CURTIS *(ex officio)*, PROFESSORS LUCH (1928), STOCKER (1929), DIEFENDERFER* (1930), BEAVER (1931).

Standing of Students: DEAN MCCONN, PROFESSORS PALMER, CAROTHERS, FOGG, LARKIN, STOUGHTON, ECKFELDT, ESTY, ULLMANN, BIDWELL (all members *ex officiis*).

Student Activities: DEAN MCCONN *(ex officio)*, PROFESSORS COWIN (1928), MILLER (1929), and three student members: MESSRS. W. M. HAND, JR., W. J. SCARLETT, J. R. DENISE.

Student Clubs: DEAN MCCONN *(ex officio)*, PROFESSORS CHAMBERLIN (1928), BECK (1929), and three student members: MESSRS. S. P. BECKER, G. W. FEARNSIDE, JR., A. F. SEARING.

Summer Session: VICE-PRESIDENT EMERY *(ex officio)*, PROFESSORS GIPSON (1928), LUCH (1929), COWIN (1930), DROWN† (1931), HUGHES (1932).

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* Absent on leave, Professor Long serving.

† Absent on leave, Professor Weida serving.

OFFICERS OF ADMINISTRATION

Office of the President

Charles Russ Richards, M.M.E., Eng.D., LL.D., *President*

Office of the Vice-President and Comptroller

Natt Morrill Emery, A.B., M.A., Litt.D., *Vice-President and Comptroller*

Frederick Ralph Ashbaugh, *Bursar and Purchasing Agent*

Melvin Schissler, C.P.A., *Bookkeeper*

Englebert Henry Baderschneider, M.E., *Manager of Supply Bureau*

James Clarence Cranmer, *Superintendent of Buildings and Grounds*

John David Hartigan, *Superintendent of the Power Plant*

Office of the Dean

Charles Maxwell McConn, B.A., M.A., *Dean*

George Bartlett Curtis, B.A., A.M., *Assistant Dean and Registrar*

Mrs. Ora Ingle Hickey, B.S., *Recorder*

Mrs. Eunice Strauss Kichline, *Assistant Recorder*

Directors of Curricula

Philip Mason Palmer, A.B., *Director of the College of Arts and Science*

Neil Carothers, B.A., Ph.D., *Director of the College of Business Administration*

Harry M. Ullmann, A.B., Ph.D., *Director of the Curricula in Chemistry and Chemical Engineering*

Ralph Justin Fogg, B.S., *Director of the Curriculum in Civil Engineering*

William Esty, S.B., M.A., *Director of the Curriculum in Electrical Engineering*

Charles Clarence Bidwell, A.B., Ph.D., *Director of the Curriculum in Engineering Physics*

FRED VIALL LARKIN, B.S., M.E., *Director of the Curricula in Mechanical Engineering and Industrial Engineering*

BRADLEY STOUGHTON, PH.B., B.S., *Director of the Curriculum in Metallurgical Engineering*

HOWARD ECKFELDT, B.S., E.M., *Director of the Curriculum in Mining Engineering*

Summer Session

NATT MORRILL EMERY, A.B., M.A., LITT.D., *Director*

Faculty

GEORGE BARTLETT CURTIS, B.A., A.M., *Secretary*

Legal Counsel

ROBERT SAYRE TAYLOR, B.S., *Legal Counsel*

Linderman Memorial Library

HOWARD SEAVOY LEACH, A.B., M.A., *Librarian*
CORA KNUTSFORD DUNNELLS, *Cataloger*
MARY GOCHER, A.B., B.S., *Assistant Cataloger*
ELIZABETH BAER HAY, A.B., B.S., *Circulation Desk Attendant*
GERTRUDE A. HOUGH, *Assistant Desk Attendant*
ROBERT F. RILEY, *Clerk*

Packer Memorial Church

THE VERY REV. DANIEL WILMOT GATESON, B.A., *Chaplain*
THOMAS EDGAR SHIELDS, A.A.G.O., *Organist*

Bureau of Student Employment and Housing

FREDERICK THOMAS TRAFFORD, *Secretary*

Students' Health Service

RAYMOND COOLEY BULL, B.S., A.B., M.D., *Director*
FRANK LEROY HALL, B.S., M.S., M.D., *Assistant Director*
MRS. CAROLYN ELIZABETH WETZEL, R.N., *Nurse in charge of Dispensary*

University Band

THOMAS EDGAR SHIELDS, A.A.G.O., *Director*

Lehigh Union

FREDERICK THOMAS TRAFFORD, *Secretary*

Standing Committees

Scholarships and Loans: Vice-President Emery, Dean McConn, Treasurer Okeson

Graduate Board: President Richards *(ex officio)*, Dean McConn *(ex officio)*, Professors Thomas, Chamberlin, Carothers, Smith, Larkin, Miller, More *(Secretary)*, Gipson, Hughes, Seyfert, Fort, Bidwell

Institute of Research: President Richards *(ex officio)*, Professors Ullmann, Fogg, Esty, Larkin, Stoughton, Eckfeldt, Bidwell, Miller, Hall, Carothers, Gipson

CURRICULA OFFERED

Lehigh University offers the following curricula:

College of Arts and Science:
- The Curriculum in Arts and Science
- The Pre-Medical Curriculum
- Courses in Preparation for Teaching

College of Business Administration:
- The Curriculum in Business Administration

College of Engineering:
- The Curriculum in Chemical Engineering
- The Curriculum in Chemistry
- The Curriculum in Civil Engineering
- The Curriculum in Electrical Engineering
- The Curriculum in Engineering Physics
- The Curriculum in Industrial Engineering
- The Curriculum in Mechanical Engineering
- The Curriculum in Metallurgical Engineering
- The Curriculum in Mining Engineering

REQUIREMENTS FOR ADMISSION

Candidates for admission to Lehigh University must be at least sixteen years of age, must present testimonials of good moral character and must be qualified in fifteen entrance units as enumerated below. The regular undergraduate curricula are open to men only.

All students entering the University are required to present a certificate of vaccination against small-pox within three years of the time of entering the University. They must also have a scar as evidence of previous successful vaccination. Students who cannot comply with this regulation will be vaccinated by the Director of the Health Service, and in case the vaccination is unsuccessful, will be re-vaccinated.

THE COLLEGE OF ARTS AND SCIENCE

Candidates for admission to the College of Arts and Science must present credit in the following units:

	Units*
English,	3
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Latin A and B, or German A, or French A, or Spanish A,	2
Elective subjects,	6½
	15

THE COLLEGE OF BUSINESS ADMINISTRATION

Candidates for admission to the College of Business Administration must present credit in the following units:

	Units*
English,	3
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Latin A and B, or German A, or French A, or Spanish A,	2
Elective subjects,	6½
	15

THE COLLEGE OF ENGINEERING

Candidates for admission to the College of Engineering must present credit in the following units:

	Units*
English,	3
History,	1
Elementary Algebra,	1
Intermediate Algebra,	½
Plane Geometry,	1
Solid Geometry,	½
Plane Trigonometry and Logarithms,	½
Latin A and B, or German A, or French A, or Spanish A,	2
Elective subjects,	5½
	15

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* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

ELECTIVE SUBJECTS

	Units*
Advanced Algebra,	½
Solid Geometry,	½
Plane Trigonometry and Logarithms,	½
Greek,	1, 2 or 3
Latin,	1, 2, 3 or 4
French,	1, 2 or 3
German,	1, 2 or 3
Spanish,	1, 2 or 3
American History,	1
Ancient History,	½ or 1
Modern History,	1
English History,	½ or 1
Civics,	½, 1 or 1½
Economics,	½ or 1
General Science,	1
Physics,	1
Chemistry,	1
Biology,	½ or 1
Botany,	½ or 1
Zoology,	½ or 1
Physiology and Hygiene,	½ or 1
Physiography,	½ or 1
Manual Training,	½ or 1
Freehand Drawing,	½
Mechanical Drawing,	½
Industrial History,	½ or 1
Commercial Geography,	½ or 1
Bookkeeping, Stenography, and Typewriting,	1 or 2

Other subjects from the curriculum of a high school of the first class may be credited up to a total of one unit.

ADMISSION BY CERTIFICATE

Lehigh University has no permanent arrangement with any school whereby certificates are accepted in place of entrance examinations; but certificates are ordinarily accepted from First-Class High Schools in Pennsylvania, and from schools accredited by the Association of Colleges and Secondary Schools of the Middle States and Maryland, the New England College Entrance Certificate Board, the Regents of the University of the State of New York, the North Central Association of Colleges and Secondary Schools, the Association of Colleges and Secondary Schools of the Southern States, and the state universities of those states which have such institutions.

An applicant for admission by certificate should request his school principal to send to the Dean, as soon as the school closes in June, a complete record of his work. Blanks for this purpose will be supplied by the University.

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* A unit represents a year's study in a single subject in a secondary school, comprising the work of 180 recitation periods (5 periods a week for 36 weeks) of forty minutes each or the equivalent.

Each candidate for admission must present full school and college records from each institution previously attended. Failure to present such records will result in cancellation of registration.

ADMISSION BY EXAMINATION

Examinations at the University

Examinations for admission to the University will be held in 1928 as follows:

Algebra, Advanced	June 14,	Sept. 7,	2:00 p.m.
Algebra, Elementary	June 14,	Sept. 7,	8:30 a.m.
Algebra, Intermediate	June 14,	Sept. 7,	10:30 a.m.
Ancient History	June 13,	Sept. 6,	2:00 p.m.
Biology	June 16,	Sept. 10,	2:00 p.m.
Botany	June 16,	Sept. 10,	2:00 p.m.
Chemistry	June 15,	Sept. 8,	8:30 a.m.
Civics	June 16,	Sept. 10,	2:00 p.m.
Commercial Geography	June 13,	Sept. 6,	2:00 p.m.
Economics	June 14,	Sept. 7,	2:00 p.m.
English	June 16,	Sept. 10,	8:30 a.m.
Freehand Drawing	June 16,	Sept. 10,	2:00 p.m.
French	June 15,	Sept. 8,	2:00 p.m.
General Science	June 16,	Sept. 10,	2:00 p.m.
Geometry, Plane and Solid	June 13,	Sept. 6,	8:30 a.m.
German	June 15,	Sept. 8,	2:00 p.m.
Greek	June 15,	Sept. 8,	2:00 p.m.
History	June 13,	Sept. 6,	2:00 p.m.
Industrial History	June 13,	Sept. 6,	2:00 p.m.
Latin	June 15,	Sept. 8,	8:30 a.m.
Mechanical Drawing	June 16,	Sept. 10,	2:00 p.m.
Physics	June 15,	Sept. 8,	8:30 a.m.
Physiography	June 16,	Sept. 10,	2:00 p.m.
Physiology	June 16,	Sept. 10,	2:00 p.m.
Problems of Democracy	June 13,	Sept. 6,	2:00 p.m.
Spanish	June 15,	Sept. 8,	8:30 a.m.
Trigonometry	June 14,	Sept. 7,	2:00 p.m.

Examinations in other subjects presented for elective units may sometimes be arranged by correspondence with the Registrar.

Candidates for admission wishing to take examinations for advanced credit in any subject should notify the Registrar before September 1.

Examinations at Schools

Upon the request of school principals the June entrance examinations may be held at schools on the regularly scheduled dates. Requests for examination papers should be sent to the Registrar before June 1.

College Board Examinations

Certificates of the College Entrance Examination Board are accepted in subjects in which the recorded grade is 60 per cent. or higher.

The examinations of the College Entrance Examination Board are held in June of each year. Information in regard to these examinations, application blanks, and a circular giving detailed definitions of requirements in all examinations may be obtained by addressing the Secretary of the College Entrance Examination Board, 431 West 117th Street, New York, N. Y. The price of the circular is twenty cents; it may be remitted in stamps.

ADMISSION TO ADVANCED STANDING

A student desiring to transfer to Lehigh from another college or university must submit an official transcript of his record in the other institution, which should include, with his college credits, a memorandum of the entrance credits accepted for admission to that other institution and a notation of honorable dismissal.

A candidate who has attended one or more colleges or universities must present a record from each of these institutions; failure to submit a complete record of former academic experience will result in cancellation of registration.

Graduates of other colleges are admitted to Lehigh University without examinations. The length of time for the completion of a curriculum will depend upon the student's attainments at entrance and upon his ability.

A student who intends to take an engineering curriculum at Lehigh University after graduation from college should so arrange his work in college as to cover as many as possible of the subjects of the freshman and sophomore years of the engineering curriculum he selects.

ADMISSION OF SPECIAL STUDENTS

Applicants for special schedules may be accepted as special students on the recommendation of the head of the curriculum in which the student proposes to do his special work, and upon approval of the Dean. Candidates must be at least twenty-one years of age and must present evidence of ability to pursue with profit the subjects that they wish to study at the University. No special student is permitted to take any subject unless in the opinion of the professor in charge he is thoroughly prepared in all the necessary preceding branches.

ADMISSION TO GRADUATE COURSES

A student who has taken the bachelor's degree or a degree in technology at any recognized college, university or technical institution may be admitted as a graduate student and by permission of the Graduate Board may pursue studies leading to the degree of Master of Arts or Master of Science under the following regulations:

(1) All work which is to be credited toward a master's degree shall be done in actual and regular attendance at the University.

(2) A minimum of thirty semester hours is required for the master's degree.

(3) Each graduate student must submit for approval of the Graduate Board the program of courses he proposes to take.

(4) At least eighteen of the required thirty semester hours must be taken in one department. The remaining twelve hours will ordinarily be taken in one or two other departments; but the entire thirty hours may, with the approval of the Graduate Board, be taken in a single department. In all cases, however, the work must be taken under at least two instructors, and the distribution of the work shall be made upon the advice and with the approval of the head of the major department.

(5) At least twelve of the eighteen semester hours required in the major department and at least fifteen of the thirty semester hours required for the degree must be taken in courses open primarily to graduates.

(6) A thesis may be required by the major department. If required, the thesis shall not count for more than six credit hours. Two bound typewritten copies of the thesis (one of which shall be an original copy) shall be submitted to the Graduate Board on or before May 15 of the year in which the degree is conferred.

(7) The Master's degree will not be granted unless the candidate has earned the grade A or B in at least three-fifths of his work. No course in which the grade earned is less than C will count towards the degree.

(8) Candidates employed as full-time teachers in the University or elsewhere may not take more than six hours of graduate work in any one semester.

(9) Tuition for graduate work is at the rate of five dollars ($5.00) per semester hour.

When all requirements have been met, the candidate will be recommended by the Faculty to the Trustees for the Master's degree appropriate to the course pursued.

ENTRANCE REQUIREMENTS IN DETAIL

ENGLISH

Preparation in English has three main objects: (a) command of correct and clear English, spoken and written; (b) ability to use the vernacular with accuracy and appreciation; and (c) some acquaintance with the simpler English classics.

English Grammar and Composition. The first two objects require instruction in grammar and composition. English grammar should be reviewed in the secondary school, and correct spelling and grammatical accuracy should be rigorously exacted in connection with all written work during the four years. The principles of English composition governing punctuation, the use of words, paragraphs, and the different kinds of composition, including letter-writing, should be thoroughly mastered; and practice in composition, oral as well as written, should extend throughout the secondary school period. Written exercises may well comprise narration, description, and easy exposition based upon the principles of elementary rhetoric, as given in any approved high school rhetoric. It is advisable that subjects for this work be taken from the students' personal experience, general knowledge, and studies other than English, as well as from his reading in literature.

Literature. The third object is sought by means of two lists of books, headed respectively reading and study, from which may be framed a progressive course in literature covering four years. In connection with both lists, the student should be trained in reading aloud and be encouraged to commit to memory some of the more notable passages both in verse and in prose. The books for reading and study are to be selected from the groups suggested by the Conference on Uniform Entrance Requirements in English. 3 units

HISTORY

The requirement in history is based on the recommendation of the Committee of Seven of the American Historical Association.

Ancient History, with special reference to Greek and Roman History, including also a short introductory study of the more ancient nations, and the chief events of the early Middle Ages down to the death of Charlemagne (814). 1 unit

Mediaeval and Modern European History, from the death of Charlemagne to the present time. 1 unit

English History, with due reference to social and political development. 1 unit

American History and Civil Government, with due reference to social and political development. 1 unit

The examinations in history will be so framed as to require comparison and the use of judgment on the pupil's part rather than the mere use of memory. The examinations will presuppose the use of good textbooks, collateral reading and practice in written work. Geographical knowledge will be tested by requiring the location of places and movements on an outline map.

MATHEMATICS

Elementary Algebra (Algebra to Quadratics). The four fundamental operations for rational algebraic expressions. Factoring, determination of highest common factor and lowest common multiple by factoring. Fractions, including complex fractions, and ratio and proportion. Linear equations, both numeral and literal, containing one or more unknown quantities. Problems depending on linear equations. Radicals, including the extraction of the square root of polynomials and of numbers. Exponents, including the fractional and negative. 1 unit

Intermediate Algebra (Quadratics and Beyond). Quadratic equations, both numeral and literal. Simple cases of equations with one or more unknown quantities that can be solved by the methods of linear or quadratic equations. Problems depending on quadratic equations. The binomial theorem for positive integral exponents. The formulas for the nth term and the sum of the terms of arithmetic and geometric progressions with applications. ½ unit

Advanced Algebra. Permutations and combinations, limited to simple cases. Complex numbers, with graphical representation of sums and differences. Determinants, chiefly of the second, third and fourth orders, including the use of minors and the solution of linear equations. Numerical equations of higher degree, and as much of the theory of equations, with graphical methods, as is necessary for their treatment, including Descartes' rule of sign and Horner's method, but not Sturm's functions or multiple roots. ½ unit

Plane Geometry. The usual theorems and constructions of good textbooks, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons; and the measurement of the circle. The solution of numerous original exercises, including locus problems. Applications to the mensuration of lines and of plane surfaces. 1 unit

Solid Geometry. The usual theorems and constructions of good textbooks, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including locus problems. Applications to the mensuration of surfaces and solids. ½ unit

Plane Trigonometry. Definitions and relations of the six trigonometric functions as ratios; circular measurements of angles. Proofs of principal formulas, in particular for the sine, cosine and tangent of the sum and the difference of two angles, of the double angle and the half angle, the product expressions for the sum or the difference of two sines or of two cosines, etc.; the transformation of trigonometric expressions by means of these formulas. Solution of trigonometric equations of a simple character. Theory and use of logarithms (without the introduction of work involving infinite series). The solution of right and oblique triangles and practical applications. Candidates must bring their logarithmic tables to the examination. ½ unit

Candidates must have a knowledge of the metric system and be prepared to solve problems in either algebra or geometry involving the use of the metric system.

GREEK

GREEK. Grammar; elementary prose composition, consisting principally of detached sentences to test the candidate's knowledge of grammatical construction; Xenophon: the first four books of the *Anabasis;* the translation, at sight, of a passage from some work of Xenophon. 2 units

GREEK. Homer's *Iliad,* I-III: The first three books of the *Iliad* (omitting II, 494-end), and the Homeric forms, constructions, and prosody. 1 unit

LATIN

The following requirements in Latin are in accordance with the recommendations made by the American Philological Association.

LATIN, A and B. First and Second Year Latin. Grammar, elementary prose composition. Reading of an amount not less than Cæsar, *Gallic War,* I-IV, selected by the schools from Cæsar (*Gallic War* and *Civil War*) and Nepos (*Lives*). 2 units

LATIN, C. Third Year Latin. Reading of an amount not less than Cicero, *Orations against Catiline, For the Manilian Law,* and *For Archias,* selected by the schools from Cicero (*Orations, Letters,* and *De Senectute*) and Sallust (*Catiline* and *Jugurthine War*). 1 unit

LATIN, D. Fourth Year Latin. Reading of an amount not less than Vergil, *Aeneid,* I-VI, selected by the schools from Vergil (*Aeneid, Bucolics,* and *Georgics*) and Ovid (*Metamorphoses, Fasti, Tristia, Amores*). 1 unit

GERMAN

ELEMENTARY GERMAN, A. This requirement follows, in the main, the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) Careful drill in pronunciation. (2) The memorizing and frequent repetition of easy colloquial sentences. (3) Drill upon the rudiments of grammar, that is, upon the inflection of the articles, of such nouns as belong to the language of everyday life, of adjectives, pronouns, weak verbs, and the more usual strong verbs; also upon the use of the more common prepositions, the simpler use of the modal auxiliaries, and the elementary rules of syntax and word-order. (4) Abundant easy exercises, designed not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression. (5) Reading of from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lesson (the teacher giving the English), and in the reproduction from memory of sentences previously read.

During the second year the work should comprise: (1) The reading of from 150 to 200 pages of literature in the form of easy stories and plays. (2) Accompanying practice, as before, in the translation into German of easy variations upon the matter read and in the off-hand reproduction, sometimes orally and sometimes in writing, of the substance of short and easy selected passages. (3) Continued drill in the rudiments of the grammar, directed to the ends of enabling the pupil, first, to use his knowledge with facility in the formation of sentences, and, secondly, to state his knowledge correctly in the technical language of grammar. 2 units

INTERMEDIATE GERMAN, B. This work should comprise, in addition to the elementary course, the reading of about 400 pages of moderately difficult prose and poetry, with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tenses and modes (with special reference to the infinitive and subjunctive), and likewise upon word order and word formation. 1 unit

FRENCH

ELEMENTARY FRENCH, A. This requirement follows in the main the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) Careful drill in pronunciation. (2) The rudiments of grammar, including the inflection of the regular and the more common irregular verbs, the plural of nouns, the inflections of adjectives, participles, and pronouns; the use of personal pronouns, common adverbs, prepositions, and conjunctions; the order of words in the sentence and the elementary rules of syntax. (3) Abundant easy exercises, designed not only to fix in the memory the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression. (4) The reading of from 100 to 175 pages of standard texts, with constant practice in translating into French easy variations upon the sentences read (the teacher giving the English), and in reproducing from memory sentences previously read. (5) Writing French from dictation.

During the second year the work should comprise: (1) The reading of from 250 to 400 pages of easy modern prose in the form of stories, plays, or historical or biographical sketches. (2) Constant practice, as in the previous year, in translating into French easy variations upon the texts read. (3) Frequent abstracts, sometimes oral and sometimes written, of portions of the text already read. (4) Writing French from dictation. (5) Continued drill upon the rudiments of grammar, with constant application in the construction of sentences. (6) Mastery of the forms and uses of pronouns and pronominal adjectives, of all but the rare irregular verb forms, and of the simpler uses of the conditional and subjunctive. 2 units

INTERMEDIATE FRENCH, B. This should comprise the reading of from 400 to 600 pages of French of ordinary difficulty, a portion to be in the dramatic form; constant practice in giving French paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; the study of a grammar of moderate completeness; writing from dictation. 1 unit

SPANISH

ELEMENTARY SPANISH, A. Two years' preparation, covering the following ground:

During the first year: (1) Drill in the correct production of Spanish sounds. (2) The rudiments of grammar, illustrated by abundant easy exercises. (3) The reading of about 150 pages of graduated text with constant translating into Spanish of easy variations of sentences read, the teacher giving the English. (4) Aural drill: practice in translating into English Spanish words, clauses, and sentences heard but not seen, the teacher giving the Spanish.

During the second year: (1) Reading of 250 to 400 pages of easy modern prose. (2) Constant practice in translating into Spanish easy variations upon the text read. (3) Aural practice and drill in pronunciation. (4) Mastery of the forms and uses of pronouns, of the subjunctive mode, and of the forms of the radical changing verbs. 2 units

INTERMEDIATE SPANISH, B. The reading of not less than 500 additional pages of Spanish prose together with the translation of at least 40 pages of simple connected English prose into Spanish. 1 unit

PHYSICS

The course of instruction in physics should include:

(a) The study of some standard text-book, for the purpose of obtaining a connected view of the subject; (b) instruction by lecture table demonstrations, to be used mainly for illustration of the facts and phenomena of physics; (c) individual laboratory work consisting of at least thirty experiments.

The aim of laboratory work should be to supplement the pupil's fund of concrete knowledge and to cultivate his power of accurate observation and clearness of thought and expression. The exercises should be chosen with a view to furnishing forceful illustrations of fundamental principles and their practical application. They should be such as to yield results capable of ready interpretation, obviously in conformity with theory, and free from the disguise of unintelligible units. 1 unit

CHEMISTRY

The requirement in chemistry is based on the report of the Committee on Chemistry of the Science Department of the National Education Association.

Elementary Chemistry. It is recommended that the candidate's preparation in chemistry include: (a) individual laboratory work, comprising at least forty exercises; (b) instruction by lecture table demonstrations, to be used mainly as a basis for questioning upon the general principles involved in the pupil's laboratory investigations; (c) the study of at least one standard text-book, to the end that the pupil may gain a comprehensive and connected view of the most important facts and laws of elementary chemistry. 1 unit

Students properly qualified will be examined in Elementary Chemistry during Freshman Week; those passing the examination will be privileged to omit Elementary Chemistry, Chem. 1 and 11, and will take instead Chem. 3 and 13 during the first term.

ZOOLOGY

Zoology. The equivalent of Jordan, Kellogg, and Heath's *Animal Studies*, with laboratory work. ½ or 1 unit

BOTANY

Botany. An amount equal to that contained in Bergen's *Foundations of Botany*, with laboratory work. ½ or 1 unit

PHYSIOLOGY AND HYGIENE

Physiology and Hygiene. A course covering approximately what is given in such a text-book as Huxley and Youman's *Physiology and Hygiene*. ½ or 1 unit

PHYSIOGRAPHY

Physiography. The study of a standard text-book in physical geography, that a knowledge may be gained of the essential principles and of well-selected facts illustrating those principles. Individual laboratory work, comprising at least forty exercises, with notebook, is recommended. ½ or 1 unit

In Zoology, Botany, Physiology and Hygiene, and Physiography the credit given depends on the extent of the course pursued in the preparatory school.

DRAWING

Freehand Drawing. Sketching of simple geometrical figures, of objects, and from copy. At least twenty plates must be submitted. ½ unit

Mechanical Drawing. The use of instruments and the preparation of at least twenty plates, illustrating the elements of descriptive geometry or simple machine parts. ½ unit

MANUAL TRAINING

Manual Training. Shop work in wood or metal in schools giving courses in manual training. ½ or 1 unit

BOOKKEEPING, TYPEWRITING, AND STENOGRAPHY

Bookkeeping, Typewriting, and Stenography, covering a formal course of study in school. 1 or 2 units

TUITION AND OTHER FEES

Tuition, in all colleges of the University, per annum	$400.00
Health Service Fee, per annum	10.00
Athletic Fee, per annum	15.00
Library Fee†	5.00
Total Annual Fees	$430.00

These fees are payable as follows:

First Semester

(Payable on the Registration Days in September)

Tuition Fee	$225.00
One-Half of the Annual Health Service Fee	5.00
Athletic Fee, in full	15.00
Three-fifths of the Annual Library Fee	3.00
Total Fees, First Semester	$248.00

Second Semester*

(Payable on the Registration Days in February)

Tuition Fee	$175.00
One-half of the Annual Health Service Fee	5.00
Two-fifths of the Annual Library Fee	2.00
Total Fees, Second Semester	$182.00

Matriculation and Graduation Fees. In addition, new students pay, once only, on admission, a Matriculation Fee of $5, and students at graduation pay a Graduation Fee of $10.

Laboratory Fees. There are also laboratory fees or deposits in laboratory courses to cover the actual cost of laboratory supplies used by the individual students and to provide for breakage of glassware and instruments. The amounts of these fees and deposits are given in the Description of Courses in connection with each laboratory course.

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* Students entering or re-entering in the second semester pay first semester fees, except that they pay only one-half the Athletic Fee, $7.50.

† Not charged in the cases of students in the Summer Session, special students, or students registered for six semester hours or less.

Late Registration Fees. The penalty for late registration is $1.00 a day, up to a maximum of $5.00, for each day of delay beyond the registration days in taking out the registration ticket; and a registration not completed within five days after the date on the registration ticket is subject to a late registration fee of $5.00 a day. No registrations will be accepted later than the tenth day of instruction.

Summer Session Tuition. The tuition for courses taken in the Summer Session is at the rate of $10.00 per credit hour.

To be eligible for a degree from Lehigh University, a student not only must have completed all of the scholastic requirements for the degree, but must have paid all University fees and all bills for the rental of rooms in the dormitories, or for damage to University property or equipment, or for any other indebtedness to the University; this regulation, however, does not apply to any indebtedness for deferred tuition or for loans from trust funds administered by the University which are protected by properly executed notes approved by the Comptroller.

Special Examination Fees. Special examinations, authorized by the Committee on Standing of Students, are subject to a fee of $5.00 each. This regulation applies to the psychological examination required of new students, if taken at other than the scheduled date. Any student who fails to keep his appointment for his physical examination is charged a late examination fee at the rate of $1.00 a day until he applies for and receives another appointment; if he fails to meet his second appointment or any succeeding appointments, he will become subject again to the same fee at the same rate.

Refunds. A refund of one-half of the tuition and laboratory fees of the current semester, one-half of the athletic fee, and the unused balance of chemistry deposits, will be made to students who formally withdraw from the University within four weeks after the beginning of the semester; a refund of three-fourths of the tuition and laboratory fees, one-half of the athletic fee and the unused balance of chemistry deposits will be made to students who formally withdraw within two weeks; a refund of the entire tuition and laboratory fees, the entire athletic fee and the unused balance of chemistry deposits will be made to students who formally withdraw within one week.

The matriculation fee, the health service fee and the library fee will in no case be refunded. If a student is obliged to withdraw through injury or other physical disability and is unable to return later in that semester, a pro-rata credit will be allowed toward the tuition of the corresponding semester a year later.

Special Schedules. Tuition for special schedules of less than twelve hours in any semester is at the rate of $12.50 per semester hour.

EXPENSES

Necessary expenses for the collegiate year, clothing and traveling not included, are estimated at $600 in addition to tuition.

The University dormitories accommodate 171 students. The charge for single rooms is $50, $65 or $80 a year; suites of three or four rooms rent at $100 or $120 for each occupant.

Applications for rooms in the University dormitories should be filed with the Bursar. A cafeteria is located in Drown Memorial Hall. Numerous private householders in the city offer rooms and board at moderate prices. Information concerning such rooms and board may be obtained from the Secretary of the Bureau of Student Employment and Housing.

Books, stationery and drawing instruments may be purchased at low prices at the Supply Bureau in the Alumni Memorial Building.

THE COLLEGE OF ARTS AND SCIENCE

The College of Arts and Science of Lehigh University offers the traditional college curriculum modified to meet the needs of modern life and thought. Such a curriculum in its purpose is primarily informing and cultural, not vocational; it seeks to gratify intellectual curiosity, to cultivate a love of learning, to impart the knowledge and discipline that are essential to intelligent and forceful living. It has also certain specific uses; it is the customary approach to the professions of medicine, law, theology and teaching, and it is the usual basis for graduate study for higher degrees.

The plan of study comprises required subjects and unassigned or elective subjects. The studies of the freshman year follow in general the subjects which have been presented for entrance. After the freshman year the curriculum becomes increasingly elective, a minimum of three hours weekly of electives being allowed in the sophomore year, six in the junior year and twelve in the senior year.

The minimum course of study comprises fifteen scholastic hours or periods weekly. Work is assigned on the assumption that two hours are required by the average student to prepare adequately for a recitation. Students of proved ability, however, are not limited to this minimum. In general, the College aims at a reasonable amount of work well done, rather than a large amount indifferently done.

Instruction is given by lectures, by recitations, by the assignment of readings and topics for study and dissertations, and, when the subject admits of it, by practical work in field or laboratory. Field work or laboratory work accompanies courses in geology, physics, chemistry, biology, psychology and allied subjects. Practice in teaching is provided in the schools of the vicinity for those who expect to follow teaching. Students residing in Leonard Hall, who are preparing under the direction of the Bishop of the Episcopal Diocese of Bethlehem for the theological seminary, have opportunity for practical religious work.

REQUIRED STUDIES

The required studies embrace courses in the Engish, French and German languages and literatures (two years each), mathematics, economics, psychology, biology, geology and philosophy, subjects which may be regarded as fundamental to the nature and purpose of the course. Students who enter with full entrance requirements in Latin and Greek (four and three units) continue these studies during the freshman year. Students who offer three units of Latin at entrance are advised to continue Latin during the freshman year. Those who have passed Latin 1 and 2 and either French 17 and 18 or German 5 and 6 are not required to take a second modern language. Sophomores who have begun Latin and Greek during the freshman year and desire to continue these studies will begin the second modern language during the junior year. Students who offer neither French nor German at entrance begin German in the freshman year.

SPECIAL REGULATIONS FOR ENGLISH

Students in the College of Arts and Science who persistently use poor English may be reported at any time to the Director of the College who may require that they take additional English without credit toward graduation. Toward the end of the junior year each junior in the College of Arts and Science must report to the Department of English for an exercise in impromptu writing. Students who are found to be seriously deficient in this test will be reported to the Director of the College who may require that they take additional English without credit toward graduation.

MAJORS

During the second semester of the sophomore year each student must select some sequence of studies as his major field. A major consists of at least twelve semester hours of advanced work in the field chosen. Majors must be approved by the professors concerned and the Director of the College.

A comprehensive examination in the major subject is required of all students. This examination is given at the end of the senior year and may be oral or written or both. The comprehensive examinations are given under the direction of the head of the major department. At least two university teachers and, whenever possible, representatives of at least two departments shall take part in the examinations.

No student will be recommended for graduation who does not attain an average of at least "C" in his major courses and a grade of at least "C" in the final comprehensive examination.

After a student has selected a major subject, the head of the department in which the major is selected becomes the official adviser of the student and guides him in his choice of electives.

On the advice of the head of the department in which the major work is being done and with the consent of the Director of the College, a senior of unusual merit who wishes to concentrate in his chosen field may be allowed to substitute not more than six hours of unscheduled work per semester for six hours of elective work otherwise required for graduation.

The Director of the College counsels students in the choice of their studies and keeps before them the importance of selecting their work according to a definite and constructive plan. Students are dealt with individually rather than in groups, and the effort is made to suit the studies of each to his qualifications and purposes.

In the following plan of study the unassigned hours are filled by subjects selected from the listed elective studies. These are not necessarily confined to the year to which they are assigned in the lists, but may be taken earlier or subsequently. But this privilege is limited by consideration of the roster and the principle that the course of each student shall be systematic and not haphazard.

The degree of Bachelor of Arts is conferred upon graduates of the College of Arts and Science.

THE CURRICULUM IN ARTS AND SCIENCE

FRESHMAN YEAR

FIRST SEMESTER

Number	Title	Cr.Hrs.
Eng. 1	English	3
Math. 1	Trigonometry	3
Math. 2	or Algebra	
Ger. 5 or 1	German	3
Fr. 17 or 19	or French	
Lat. 1, 31 or 33	Latin	3
Lat. 21	or Anc. Civ.	
Gk. 5 or 1	Greek	3
Chem. 1 or 3	or Chem. 2	
Chem. 12 or 14	& Chem. Lab. 1	
Phys. 12	or Physics	
Mil. 1	M. S. & T.	2
P.E. 1	Physical Ed.	—
Chap. 1	Chapel	—
Lect. 1	Lectures	—
		17

SECOND SEMESTER

Number	Title	Cr.Hrs.
Eng. 2	English	3
Math. 2	Algebra	3
Astr. 1	or Des. Astr.	
Math. 3	or Anal. Geom.	
Math. 16	or Sol. Geom.	
Ger. 6 or 2	German	3
Fr. 18 or 20	or French	
Lat. 2, 32 or 34	Latin	3
Lat. 22	or Anc. Civ.	
Gk. 6 or 2	Greek	3
Chem. 21	or Qual. An. 2	
Chem. 8	& Stoich. 1	
Phys 13	or Physics	
Mil. 2	M. S. & T.	2
P.E. 2	Physical Ed.	—
Chap. 2	Chapel	—
Lect. 2	Lectures	—
		17

SOPHOMORE YEAR

FIRST SEMESTER

Eng. 4 or 6	English	3
Bus. 3	Economics	3
Ger. 1, 3 or 9	German	3
Fr. 3, 5, 27 or 29	French	3
Mil. 3	M. S. & T.	2
	Electives	3
P.E. 3	Physical Ed.	—
Chap. 3	Chapel	—
Lect. 3	Lectures	—
		17

SECOND SEMESTER

Eng. 5 or 7	English	3
Bus. 4	Economics	3
Ger. 2, 4 or 10	German	3
Fr. 4, 6, 28 or 30	French	3
Mil. 4	M. S. & T.	2
	Electives	3
P.E. 4	Physical Ed.	—
Chap. 4	Chapel	—
Lect. 4	Lectures	—
		17

JUNIOR YEAR

FIRST SEMESTER

Psych. 1	Psychology	3
Fr. 13	French	3
Ger. 3	or German	
Biol. 1	Biology	3
	Electives	6
P.E. 5	Physical Ed.	—
Lect. 5	Lectures	—
		15

SECOND SEMESTER

Psych. 2 or 4	Psychology	3
Fr. 14	French	3
Ger. 4	or German	
Geol. 4	Geology	2
Geol. 6	Geology Trips	1
	Electives	6
P.E. 6	Physical Ed.	—
Lect. 6	Lectures	—
		15

SENIOR YEAR

FIRST SEMESTER

Phil. 1	Philosophy	3
	Electives	12
P.E. 7	Physical Ed.	—
		15

SECOND SEMESTER

Phil. 2	Philosophy	3
	Electives	12
P.E. 8	Physical Ed.	—
		15

ELECTIVE STUDIES

SOPHOMORE ELECTIVES

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr. Hrs.*	*Number*	*Title*	*Cr. Hrs.*
Bus. 49	Econ. Geography	3	Astr. 1	Des. Astron.	3
Chem. 1 & 11	Chemistry	3	Biol. 6	Botany	3
Chem. 6	Adv. Chemistry	3	Bus. 50	Econ. Geography	3
Educ. 1	Education	3	Chem. 21 & 8	Chemistry	3
Fr. 3 or 5	El. French	3	Chem. 7	Adv. Chemistry	3
Ger. 1	El. German	3	Educ. 2	Hist. of Educ.	3
Govt. 51	American Govt.	3	Fr. 4 or 6	El. French	3
Gk. 7, 1 or 3	Greek	3	Ger. 2	El. German	3
Hist. 1	Med. History	3	Govt. 52	American Govt.	3
Hist. 9	English Hist.	3	Gk. 8, 2 or 4	Greek	3
Hist. 13	United States Hist.	3	Hist. 2	Med. History	3
Lat. 3, 1, 31 or 33	Latin	3	Hist. 10	English History	3
Math. 3	Anal. Geom.	3	Hist. 14	United States Hist.	3
Math. 4	Elem. Calculus	3	Lat. 4, 2, 32 or 34	Latin	3
Math. 15	Reading	—	Math. 4	Elem. Calculus	3
Math. 16	Solid Geom.	3	Math. 5	Appl. Calculus	3
Math. 54	Hist. of Math.	3	Math. 15	Reading	—
Math. 51	Adv. Algebra	3	Math. 16	Solid Geom.	3
Phil. 3	Intro. Philosophy	3	Math. 54	Hist. of Math.	3
Phil. 4a	Man Thinking	3	Math. 51	Adv. Algebra	3
Phil. 5	Phil. of Rel.	1	Math. 53	Anal. Geom.	3
Phil. 11	Ethics	1	Phil. 14	Sci. Method	3
Phys. 12	Physics	3	Phil. 4b	Man & the Cosmos	3
Phys. 14	Physics	3	Phil. 6	Phil. of Rel.	1
Phys. 1	Gen. Physics	3	Phil. 12	Ethics	1
Phys. 1a	Physics Lab.	1	Phys. 13	Physics	3
Span. 5 or 7, 15 or 17	Spanish	3	Phys. 15	Physics	3
			Phys. 2	Gen. Physics	3
			Phys. 3	Physics Lab.	1
			Span. 6 or 8, 16 or 18	Spanish	3

JUNIOR ELECTIVES

FIRST SEMESTER			SECOND SEMESTER		
Bus. 7	Adv. Economics	3	Astr. 2	Gen. Astronomy	3
Bus. 11	Accounting	3	Bus. 8	Adv. Economics	3
Bus. 21	Corp. Finance	3	Bus. 12	Accounting	3
Bus. 29	Money and Bank.	3	Bus. 22	Corp. Finance	3
Bus. 57	Marketing	3	Bus. 30	Money and Bank.	3
Chem. 30	Quant. Anal.	3	Bus. 56	Bus. Law	3
Chem. 41	Quant. Anal. Conf.	1	Biol. 3	Comp. Anat.	3
Educ. 7	High School Teach.	3	Biol. 2	Mam. Anatomy	3
Eng. 6, 10, 18, 20, 23, 25, 31	English	3	Chem. 31	Quant. Anal.	3
Eng. 43	Journalism	3	Chem. 45	Quant. Anal. Conf.	1
F.A. 1	Ap. Fine Arts	3	Educ. 8	School Systems	3
F.A. 3	Hist. Architect.	3	Eng. 7, 11, 19, 21, 24, 32	English	3
F.A. 5	Freehand Draw.	3	Eng. 44, 45	Journalism	3
Fr. 13, 31, 37 or 39	French	3	F.A. 2	Ap. Fine Arts	3
Geol. 1	Mineralogy	4	F.A. 4	Hist. Architect.	3
Ger. 3, 9, 11	German	3	F.A. 6	Freehand Draw.	3
Govt. 57	Municipal Man.	3	Fr. 14, 32, 38 or 40	French	3
Govt. 55	Int. Relations	3	Geol. 5	Petrology	1
Gk. 5, 9	Greek	3	Ger. 4, 10, 12	German	3
Hist. 11	Colonial History	3	Govt. 54	Political Sci.	3
Hist. 39	Civil War	3	Govt. 56	Inter. Law	3
Hist. 17	French Rev.	3	Govt. 58	Municipal Man.	3
Ital. 1	Italian	3	Gk. 6, 10	Greek	3
Lat. 5	Latin	3	Hist. 12	Colonial History	3
			Hist. 18	French Rev.	3

Math. 5	Appl. Calculus	3	Hist. 40	Reconstruction	3
Math. 6	Adv. Calculus	3	Ital. 2	Italian	3
Math. 52	Proj. Geom.	3	Lat. 6	Latin	3
Math. 53	Anal. Geom.	3	Math. 6	Adv. Calculus	3
Mil. 5	Advanced M.S.T.	3	Math. 52	Proj. Geom.	3
Phys. 4	Mech., Heat & Light	3	Math. 95	Anal. Mech.	3
Phys. 5	Physics Lab.	1	Mil. 6	Advanced M.S.T.	3
Span. 25, 27	Spanish	3	Phys. 6	Elec, Mag. & Sound	3
			Phys. 7	Physics Lab.	1
			Span. 26, 28	Spanish	3

SENIOR ELECTIVES

FIRST SEMESTER			SECOND SEMESTER		
Biol. 5	Physiology	2	Biol. 12	Histology Tech.	2
Biol. 4	Embryology	3	Biol. 53	Adv. Bacteriology	2
Biol. 54	Bacteriology	3	Biol. 58	Immunology	3
Bus. 23	Investments	3	Bus. 26	Public Finance	3
Bus. 61	Sociology	3	Bus. 62	Sociology	3
Bus. 21	Corp. Finance	3	Chem. 61	Organic Chem.	3
Chem. 60	Organic Chem.	4	Chem. 66	Org. Chem. Lab.	3
Chem. 65	Org. Chem. Lab.	2	Educ. 10	Education	3
Educ. 11	Prob. Education	3	Educ. 14	Contem. Educ.	3
Educ. 15	Pract. Teach.	3	Educ. 16	Pract. Teach.	3
Eng. 27, 29	English	3	Eng. 22, 28, 30	English	3
Eng. 46	Journalism	3	Eng. 47	Journalism	3
Fr. 27, 29, 32, 47	French	3	Fr. 28, 30, 48	French	3
Fr. 93	Oral Comp.	2	Fr. 94	Oral Comp.	2
Fr. 95	Methods	1	Fr. 96	Methods	1
Geol. 7	Econ. Geol.	2	Geol. 8	Econ. Geol.	3
Geol. 11	Field Geology	2	Geol. 9	Paleontology	3
Geol. 12	Petrography	2	Geol. 10	Strat. Geology	2
Geol. 14	Struct. Geol.	1	Geol. 15	Methods	3
Ger. 13, 15	German	3	Ger. 14, 16, 21	German	3
Gk. 11	Greek	3	Gk. 12, 13	Greek	3
Hist. 19	Seminar	3	Hist. 20	Seminar	3
Lat. 10	Latin	3	Lat. 11	Latin	3
Math. 11	Dif. Equations	3	Math. 12	Dif. Equations	3
Mil. 7	Advanced M.S.T.	3	Mil. 8	Advanced M.S.T.	3
Phil. 7	Seminar	3	Phil. 8	Seminar	3
Phys. 8	Adv. Elec. & Mag.	2	P.E. 22, 23, 24	Physical Ed.	3
Phys. 9	Physics	2	Phys. 17	Th. Physics	3
Phys. 10	Electrical Lab.	1	Phys. 19	Phys. Lab.	2
Phys. 16	Th. Physics	2	Psych. 3	Adv. Ed. Psych.	3
Phys. 18	Physics Lab.	1	Psych. 6	Psychology	3
Psych. 3	Adv. Ed. Psych.	3	Psych. 12	Seminar	3
Psych. 11	Seminar	3	Span. 36, 42, 44	Spanish	3
Psych. 13	Clinical Psych.	2 or 3			
Span. 35, 41, 43	Spanish	3			

PREPARATION FOR ENGINEERING

If a student in the College of Arts and Science contemplates becoming a candidate for a degree in engineering after the completion of his B.A. curriculum, he should choose as electives in his third and fourth years such science studies as are contained in the first and second years of the engineering curriculum which he wishes afterwards to complete. By carefully selecting electives, with the advice and guidance of the director of his curriculum and the professor in charge of the engineering curriculum concerned, the graduate of the B.A. course may enter the engineering curriculum chosen as a junior in full standing, and obtain his engineering degree in two years of further study.

PRE-MEDICAL CURRICULUM

Certain medical schools require for entrance a college course in addition to a high school course; others require a high school course yielding fifteen or more college entrance credits and at least two years in a college of liberal arts with about three-fourths of the study devoted to chemistry, physics and biology.

The following four-year curriculum has been prepared for students who intend to enter a medical school, but plan, before doing so, to complete their college course and obtain their degree.

THE PRE-MEDICAL CURRICULUM

FIRST SEMESTER — FRESHMAN YEAR — SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Eng. 1	English	3	Eng. 2	English	3
Math. 1	Trigonometry	3	Math. 2	Algebra	3
Math. 2	or Algebra		Astr. 1	or Des. Astr.	
Ger. 5 or 1	German	3	Math. 3	or Anal. Geom.	
Fr. 17 or 19.	or French		Math. 16	or Sol. Geom.	
Lat. 1, 31 or 33	Latin	3	Ger. 6 or 2	German	3
Lat. 21	or Anc. Civ.		Fr. 18 or 20.	or French	
Chem. 1 or 3	Chemistry	2	Lat. 2, 32 or 34	Latin	3
Chem. 11 or 13	Chem. Lab.	2	Lat. 22	or Anc. Civ.	
Mil. 1	M. S. & T.	2	Chem. 20	Qual. Anal.	3
P.E. 1	Physical Ed.	—	Chem. 8	Stoichiometry	1
Chap. 1	Chapel	—	Mil. 2	M. S. & T.	2
Lect. 1	Lectures	—	P.E. 2	Physical Ed.	—
			Chap. 2	Chapel	—
			Lect. 2	Lectures	—
		18			18

FIRST SEMESTER — SOPHOMORE YEAR — SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Eng. 4 or 6	English	3	Eng. 5 or 7	English	3
Fr. 5, 7, 27 or 29	French	3	Fr. 6, 8, 28 or 30	French	3
Ger. 1, 3 or 9	German	3	Ger. 2, 4 or 10	German	3
Phys. 12	Physics	3	Phys. 13	Physics	3
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		17			17

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Psych. 1	Psychology	3	Psych. 2	Psychology	3
Fr. 15 or 13	French	3	Fr. 16 or 14	French	3
Ger. 3	or German		Ger. 4	or German	
Biol. 1	Biology	3	Biol. 3	Comp. Anatomy	3
Chem. 30	Quant. Anal	3	Biol. 2	Mammal. Anat.	2
Chem. 41	Quant. Anal. Conf.	1	Biol. 9	Genetics	1
Phys. 14	Physics	3	Phys. 15	Physics	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
Lect. 5	Lectures	—	Lect. 6	Lectures	—
		16			15

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Phil. 1	Philosophy	3	Phil. 2	Philosophy	3
Chem. 60	Organic Chem.	4	Chem. 61	Organic Chem.	3
Chem. 65	Org. Chem. Lab.	2	Chem. 66	Org. Chem. Lab.	3
Biol. 4	Embryology	3	Psych. 6	Psychology	3
Biol. 54	Bacteriology	3		Electives	3
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		15			15

For students who cannot devote four years to college work preparatory to entering upon the study of medicine, there may be arranged upon consultation a course which will give the student in three years the credits demanded by the medical schools for admission.

PREPARATION FOR TEACHING

Students who expect to teach upon graduation should consult with the Department of Education early in their college course. A license or certificate is required of every one who teaches in the public schools of Pennsylvania or of any other State. The approved certificate in Pennsylvania for college graduates is the College Provisional Certificate granted upon completion of eighteen semester hours of professional or pedagogical courses and a minimum of twelve semester hours in each subject which the candidate expects to teach. With the completion of three years of successful teaching and additional preparation amounting to six semester hours the certificate is made permanent. These eighteen semester hours of professional studies are apportioned as follows:

Introduction to Teaching (3)	cf. Educ. 1
Educational Psychology (3)	cf. Psych. 2
Practice Teaching (6)	cf. Educ. 15 and 16
Elective studies (6)	Educ. 2, 7, 8, 9, 10, 11, 14 and Psych. 3, 13 and 14 are suitable.

The requirements for certification in other States are similar to those in Pennsylvania, with minor differences.

Attention is drawn to the regulations concerning the selection of a major study, as outlined in the foregoing description of the Curriculum in Arts and Science. The student who is preparing to teach should major in either the subject he prefers to teach or Education. Special method courses may be taken in the several departments that deal with the subject matter of school instruction: language, science, etc. Practice teaching is done mainly in the Bethlehem High School; but observation, practice and substitute teaching may be done in elementary schools in Bethlehem and elsewhere. The Department of Physical Education offers courses which should appeal to students who anticipate coaching and supervision of physical education. Courses offered by the Department of Education are essential for public school teachers of physical education.

Teacher Placement Committee

The Teacher Placement Committee is charged with placing qualified Lehigh graduates who wish to teach. The University gives its official recommendation of a candidate only through this Committee. Students who desire to teach should call upon the Secretary of the Committee, Professor Drown, for advice and direction. No fees are charged; the service is available for every Lehigh student.

THE COLLEGE OF BUSINESS ADMINISTRATION

The first function of the College of Business Administration is to provide for students intending to enter business rather than the professions thorough training in the principles which underlie all business activity. With this end in view the College offers a four-year curriculum which covers the fundamental economic principles that control the growth and operation of industrial and commercial enterprises, the general laws that determine economic progress, and the basic facts of accounting, finance and statistics that are applicable to all business.

The curriculum does not pretend to equip students for the management of enterprises or the holding of responsible business positions immediately after graduation. The College of Business Administration makes no attempt to provide a substitute for the training and experience in the complex details of any particular business that can be gained only from actual contact with that business. The primary aim is to develop in the student an intelligent understanding of forces and principles, an ability to analyze industrial and commercial phenomena, and a habit of thought that will enable him in later life to cope with the problems which increasing executive responsibility will bring. Above all the curriculum is intended to give the student such familiarity with various types of business that he can intelligently choose the special branch in which he is most likely to succeed without trusting to the fortuitous hazards of personal connections and opportunity.

In accordance with this plan of training in fundamentals the curriculum in Business Administration is more rigidly outlined than the ordinary curriculum of this type, with less opportunity than is customary for a narrow specialization in a technical field and more emphasis on general social and economic subjects. The student who is especially interested in some such field of work as accounting or finance or industrial administration is given every opportunity to specialize in that field, but the curriculum does not permit specialization at the expense of the work in the fundamentals of industrial history, economic development and social problems.

The freshman year is largely devoted to the work in science, mathematics, English and languages which is essential as a background for the specialized work of the later years. There is an introductory course which outlines the development of economic life. The sophomore year takes up the work in economic principles and accounting, the two courses serving as a foundation for all subsequent courses in business. The junior and senior years are devoted chiefly to technical business courses, with sufficient freedom of choice to permit the student to follow his specific interests.

A second function of the College of Business Administration is to afford to students in the College of Arts and Science and in the various engineering curricula of the University an opportunity to receive instruction in the fundamental facts and principles of economics, now generally included in the curriculum of all college students, whether in the more generalized cultural curricula or in the highly specialized professional engineering fields. A special service in this connection is the provision of courses in the Curriculum in Industrial Engineering.

Graduates of this curriculum receive the degree of Bachelor of Science in Business Administration.

THE CURRICULUM IN BUSINESS ADMINISTRATION

FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Eng. 1	English	3	Eng. 2	English	3
Bus. 1	Ind. Evolution	3	Bus. 2	Ind. Evolution	3
Math. 1	Trigonometry	3	Math. 2	Algebra	3
Math. 2	or Algebra		Math. 3	or Anal. Geom.	
Fr. 1, 3, 17 or 19	French	3	Astr. 1	or Des. Astr.	
Ger. 5 or 1	or German		Math. 16	or Sol. Geom.	
Span. 1, 3, 15 or 17	or Spanish		Fr. 2, 4, 18 or 20	French	3
Chem. 1 or 3	Chemistry ... 2	3	Ger. 6 or 2	or German	
Chem. 12 or 14	& Lab. 1		Span. 2, 4, 16 or 18	or Spanish	
Phys. 12	or Physics		Chem. 21	Qual. Anal. .. 2	3
Geol. 16	or Physiog.		Chem. 8	& Stoich. .. 1	
Biol. 7	or Biology		Phys. 13	or Physics	
Mil. 1	M. S. & T.	2	Geol. 17	or Physiog.	
P.E. 1	Physical Ed.	—	Biol. 8	or Biology	
Chap. 1	Chapel	—	Mil. 2	M. S. & T.	2
Lect. 1	Lectures	—	P.E. 2	Physical Ed.	—
			Chap. 2	Chapel	—
			Lect. 2	Lectures	—
		17			17

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 3	Economics	3	Bus. 4	Economics	3
Bus. 11	Accounting	3	Bus. 12	Accounting	3
Psych. 10	Psychology	3	Psych. 15	Ind. Psychol.	3
Hist. 13	U. S. History	3	Hist. 14	U. S. History	3
Fr. 11, 13, 27 or 29	French	3	Fr. 12, 14, 28 or 30	French	3
Ger. 3 or 9	or German		Ger. 4 or 10	or German	
Span. 11, 13, 25 or 27	or Spanish		Span. 12, 14, 26 or 28	or Spanish	
Eng. 4, 6 or 10	or English		Eng. 5, 7 or 11	or English	
Mil. 4	M. S. & T.	2	Mil. 4	M. S. & T.	2
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		17			17

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 29	Money & Bank.	3	Bus. 30	Money & Bank.	3
Bus. 21	Corp. Finance	3	Bus. 22	Corp. Finance	3
Bus. 49	Econ. Geography.	3	Bus. 50	Econ. Geography.	3
Govt. 51	American Govt.	3	Govt. 52	American Govt.	3
Bus. 13	Adv. Accounting	3	Bus. 14	Adv. Accounting	3
Bus. 33	or Labor		Bus. 38	or Transport.	
Math. 41	or Math. of Fin.		Math. 42	or Math. Stat.	
	Electives	3		Electives	3
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
Lect. 5	Lectures	—	Lect. 6	Lectures	—
		18			18

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Bus. 61	Sociology	3	Bus. 62	Sociology	3
Bus. 45	Statistics	3	Bus. 46	Bus. Cycles	3
Any two of the following:			Any two of the following:		
Bus. 15	Cost Accounting	6	Bus. 16	Acct. Systems	6
Bus. 7	Adv. Economics.		Bus. 8	Adv. Economics.	
Bus. 39	Ind. Management		Bus. 40	Ind. Management	
Bus. 23	Investments		Bus. 26	Public Finance.	
Bus. 57	Marketing		Bus. 56	Business Law.	
	Electives	6		Electives	6
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		18			18

Options and free electives in Business Administration must be approved by the Director of the Curriculum.

THE COLLEGE OF ENGINEERING

General Statement

The College of Engineering offers courses of study in Chemical Engineering, Chemistry, Civil Engineering, Electrical Engineering, Engineering Physics, Industrial Engineering, Mechanical Engineering, Metallurgical Engineering and Mining Engineering.

These courses of study have recently undergone extensive revision, and the outlines given in the following pages embody the results of this revision. These outlines are to be followed by students entering in September, 1926, and thereafter. Members of the classes of 1928 and 1929 follow the former curricula as given in the Register for 1925-1926.

The Revised Curricula

The revised curricula were formulated on the basis of an intensive study, by the Faculty of Lehigh University, of the problems of technical education and the changing needs of modern industry. This study led to the conclusions that greater emphasis than heretofore should be placed upon the fundamentals of engineering, including mathematics, physics, chemistry, and theoretical and applied mechanics, and less emphasis upon the highly specialized details of engineering practices; and that the engineer must know something of the social sciences: that is, the sciences which deal with human relations, and be familiar with the methods of business organization and administration. In the hope, therefore, that the University may provide a still more effective preparation for service to industry and for professional work in engineering, the various engineering curricula have been revised to increase the time devoted to fundamentals and to decrease that assigned to specialized technical instruction. In addition, these revisions include a substantial increase in nontechnical subjects which are a part of the equipment of every well educated man and which are now recognized as essential to the proper training of engineers because of their practical applications in industrial and business life.

Among the noteworthy features of the new curricula the following may be mentioned:

(1) Provision is made for a uniform freshman year in the College of Engineering, so that no student is required to select his course of study until he is better prepared, after a year of college work, to choose wisely. The requirements in the sophomore year for the various curricula are similar although not entirely uniform. A student can, however, change from one curriculum to another at the close of his second year with little loss of time.

(2) The work of the first two years is fairly self-contained. To those who for one reason or another are unable to complete their engineering training, it affords preparation for careers as draftsmen, electricians, surveyors, shop foremen, or assistants in industrial laboratories or plants. Students who complete successfully the work of the first two years without conditions or failures and who then withdraw from the University are given a certificate of work completed.

(3) At the close of the second year a comprehensive examination is required on the work of the first two years; and a student's admission to the junior class is based upon (a) his scholastic record for the first two years, (b) the results of his comprehensive examination, and (3) his "aptitude" for engineering work as determined by his instructors' estimates of his ability to think, of his interest in the subjects taken, and of his accuracy and industry.

(4) Since the University recognizes that an engineer cannot be trained by purely academic process, the degree awarded upon graduation, beginning with the Class of 1930, will be Bachelor of Science in the particular division of engineering that has been studied, for example, B.S. in Civil Engineering. The successful completion of one year of graduate study will lead to the degree of Master of Science in the particular division of engineering studied.

(5) Professional engineering degrees such as Civil Engineer (C.E.), Mechanical Engineer (M.E.), etc., will be awarded to graduates of Lehigh University having the degree of Bachelor of Science in Civil Engineering, Bachelor of Science in Mechanical Engineering, etc., who have had not less than

five years of acceptable practical experience in responsible charge of work after graduation, and who submit a suitable thesis.

Engineering Conferences

Throughout the freshman year weekly conferences are held by the directors of curricula, to which groups of students must go in turn for orientation, motivation and vocational guidance. During the sophomore year these conferences are continued in the curriculum of the student's choice. By means of these conferences and by the appraisal made by each instructor throughout the freshman and sophomore years, an estimate of the student's aptitude for further engineering work is attempted.

Selection of Specialized Curricula

In the spring of his freshman year each engineering student must announce his selection of the particular engineering curriculum which he desires to continue. This announcement must be made by members of the Class of 1931 not later than April 16, 1928.

Options at the End of the Sophomore Year

At the end of the sophomore year three avenues are open to the students:

(1) They may continue the curriculum elected, provided (a) that they have acquired the necessary scholastic record; (b) that they pass the required comprehensive examination on the work of the first two years; (c) that they have exhibited the necessary aptitude for the work of their choice.

(2) They may transfer to other curricula in engineering; to the College of Arts and Science, or to the College of Business Administration, provided: (a) that they have acquired the necessary scholastic record; (b) that they have exhibited the necessary aptitude for the work of their choice.

(3) They may withdraw with a certificate of completion of two years' work, provided that they have satisfactorily completed all of the work of the first two years.

The Uniform Freshman Year

An outline follows of the work of the freshman year, uniform for all engineering students. For descriptions of the work of the upper three years, varying according to the several specialized curricula, see the subsequent pages.

ALL ENGINEERING CURRICULA

FRESHMAN YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Math. 2	Algebra	3	Math. 3	Analytic Geom.	3
Chem. 1 or 3	Chemistry	2	Chem. 20	Qual. Anal.	3
Chem. 11 or 13	Chem. Lab.	2	Chem. 8	Stoichiometry	1
Phys. 1	Gen. Physics	3	Phys. 2	Gen. Physics	3
Phys. 1a	Physics Lab.	1	Phys. 3	Physics Lab.	1
Eng. 1	English	3	Eng. 2	English	3
C.E. 1	Drawing	2	C.E. 2	Drawing	2
Mil. 1	M. S. & T.	2	Mil. 2	M. S. & T.	2
E.C. 1	Eng. Conferences	—	E.C. 2	Eng. Conferences	—
P.E. 1	Physical Ed.	—	P.E. 2	Physical Ed.	—
Chap. 1	Chapel	—	Chap. 2	Chapel	—
Lect. 1	Lectures	—	Lect. 2	Lectures	—
		18			18

SUMMER SESSION

For students who at the end of the freshman year elect Electrical Engineering, Engineering Physics, Industrial Engineering, Mechanical Engineering or Metallurgical Engineering: C.E. 6, Land and Topographic Surveying, four weeks, 4.

For students who elect Civil Engineering or Mining Engineering: C.E. 6, Land and Topographic Surveying, four weeks, 4; and C.E. 7, Railroad Surveying, two weeks, 2.

There is no required work in the summer following the freshman year for students who elect Chemical Engineering or Chemistry.

THE CURRICULUM IN CHEMICAL ENGINEERING

The curriculum in Chemical Engineering is designed to prepare the student for the profession of chemical engineer, which includes the construction, control and management of manufacturing establishments in which new substances are produced. Such substances are paper made from wood, gasoline from petroleum, acids, dyes and other synthetic products, glass, photographic films and hundreds of other substances which are part of our daily life. The Chemical Engineer may choose his initial employment in laboratory work or he may keep scientific oversight of machinery and processes in plant operation. He should ultimately rise to general superintendencies and higher responsibilities. Aside from the primary requirement of chemistry, the modern chemical engineer needs a thorough knowledge of physics and mathematics, together with a sound understanding of such fundamentals in chemical, mechanical and electrical engineering as will make him a discriminating research and operating engineer.

The following descriptions of chemistry studies apply to these subjects in the Curriculum in Chemistry and in the Curriculum in Chemical Engineering.

Elementary Chemistry, begun in the freshman year, is taught through lectures and demonstrations, supplemented by experiments in the laboratory which develop manipulative skill and make careful observation habitual. An alternate course, less elementary in both class room and laboratory, is given to entering students who have had a considerable training in elementary chemistry.

After this preliminary view of the elements of chemistry, there is developed that deeper insight into the changes of matter which is the particular province of general chemistry. In Advanced Chemistry of the first term in the sophomore year additional attention is paid to the modern theories and concepts of chemistry, including solution, equilibrium and energy relations of molecules and of atoms, radio-activity, etc.,—a kind of junior physical chemistry of the greatest everyday importance in chemical engineering. Continued through the second term, this subject covers a moderately advanced study of chemical substances and their preparation and properties, together with an elementary consideration of phase rule and of such general applications as the relations underlying desirable properties in alloys, iron and steel, etc.

Organic Chemistry, taught during the entire junior year, acquaints the student with the simple compounds of carbon, and with the usefulness of this branch of chemistry in science, in the chemistry of animal and plant life, and in the manufacture and research investigation of such chemical products as synthetic dyes, drugs and medicines, varnishes, artificial silk, and many others.

A course of lectures of two hours a week on Advanced Organic Chemistry is offered in the first half of the senior year to students who have shown ability in the Organic Chemistry and Organic Chemistry Laboratory of the junior year.

An introduction to the chemical analysis of substances and to the chemistry of metals is given through Qualitative Analysis in the second term of the freshman year. The simpler mathematical relations of chemical processes are reviewed under Stoichiometry and are illustrated through many problems solved by the student. Quantitative Chemical Analysis by gravimetric, volumetric and electrolytic methods, which continues through the sophomore year, takes up the analysis of ores, fuels, metallurgical products, commercial chemicals and by-products. In frequent class room conferences accompanying the laboratory work are considered the calculations involved in and the scientific foundations of quantitative analysis. The analysis of industrial organic substances and of food-stuffs and drinking and boiler waters is placed in the final term of the senior year, when the student has a better foundation in Industrial Chemistry.

Fire-assaying of ores and of gold and silver bullion is taught in the summer term after the sophomore year when continuous attention throughout the day can be given to muffles and furnaces. The practice in furnace work is accompanied by an extensive consideration of the calculations and theories involved in the production of mixtures favorable for the work in hand. The tests necessary for a valuation and understanding of coal, gas and petroleum are studied in the same summer term, and include the calorimetry of fuels.

The laboratory methods of Physical Chemistry and the systematic deeper study of the generalizations of chemistry learned in the sophomore year are reserved for the senior year under Physical Chemistry. Interrelations of the fundamentals of matter and energy are developed under such cognate headings as two-phase and multiphase systems, thermodynamics, gas reactions, mass action, electrochemistry, colloid chemistry, etc. Attention is given to the usefulness of physical chemistry in the solution of manufacturing problems in Chemical Engineering.

Intensive instruction in the application of factory methods in Chemical Engineering is placed in the junior and senior years and is grouped under Chemical Engineering, Chemical Engineering Laboratory and Chemical Engineering Practice. The processes reviewed are varied; such as transportation of gases, liquids and solids; grinding and pulverizing; mechanical, hydraulic and pneumatic separation; evaporation; distillation; filter pressing; centrifuging; autoclaving. The characteristics and adaptability of engineering materials used in apparatus and machines receive full discussion. Selected industries are investigated and explained. Familiarity with manufacture in its scientific and economic aspects is promoted in a special laboratory fitted with industrial apparatus, the student finally submitting full working specifications for a plant designed for the preparation of some industrial product, together with estimates of the cost of raw material and the cost of conversion into the finished product. Brief practice in leveling and transit work leads to some comprehension of the application of surveying in lay-out of industrial plant. Lehigh University is fortunately situated in the Lehigh Valley, abounding in business enterprises which involve chemical engineering. Many diversified factory processes are in operation within ten minutes' drive of the University and this variety is greatly extended within half an hour's drive. Visits are also made to factories in the nearby cities of Philadelphia and New York.

In Research Chemistry in the senior year every student is required to solve a novel problem having a scientific basis, and is expected to demonstrate some ability as an independent research worker. The research involves an exhaustive search for and study of the literature bearing on the subject in the

University Library, including the patent literature. A short course in the History of Chemistry, with individual reading of significant records, coordinates the past progress of the science and leads to a nobler pride and an enhanced initiative in the profession which the graduate enters.

Metallurgy, taken in the Department of Metallurgy, gives special training in the principles and methods applied to the recovery of metals from their ores and to the manufacture and properties of iron and steel. Drawing is under the direction of the Department of Civil Engineering, as is the course in Mechanics of Materials, often called Strength of Materials. Instruction in mechanical engineering, so important to the chemical engineer, is given by the Mechanical Engineering Department. Training in Mechanical Engineering is afforded by the courses in Heat Engines of the junior year, and is continued in the Engineering Laboratory of the summer term following the junior year. Many of the problems and innovations of chemical engineering demand a more intimate knowledge of the principles and practice of electrical engineering than is given in the general course in physics; this is provided for in the junior year under Dynamos and Motors and Alternating Currents, with their laboratory adjuncts, in the Department of Electrical Engineering. A comprehension of the scope and general methods of Geology is attained in a short course in this subject. In Bacteriology, a lecture and laboratory course, a working knowledge is obtained of bacteriological methods as applied to water and some industrial products. The study of German, a necessary tool in current chemistry, is carried by all students in the sophomore year. Students who enter with German may elect Bacteriology in the junior year. An approach to problems of business is made in the course in Economics given by the College of Business Administration.

Students whose previous record is high may carry freely elected courses in addition to those regularly listed in the curriculum.

A scientific society is attached to the Department, with a membership of teachers and students, for the presentation of papers, the discussion of current journals, and the entertainment of speakers of note in the professions of chemistry and of chemical engineering.

The degree granted on completion of the curriculum is Bachelor of Science in Chemical Engineering.

THE CURRICULUM IN CHEMICAL ENGINEERING

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Chem. 30	Quant. Anal	3	Chem. 31	Quant. Anal	3
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Ger. 1 or 5	German	3	Ger. 2 or 6	German	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		19			19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas and Oil Analysis, four weeks, 4.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Chem. 78	Chem. Eng.	3	Chem. 61	Organic Chem.	3
Chem. 60	Organic Chem.	4	Chem. 66	Org. Chem. Lab.	3
Chem. 65	Org. Chem. Lab.	2	E.E. 52	Alt. Currents	2
E.E. 50	Dyn. & Motors	2	E.E. 53	Dynamo Lab.	1
E.E. 51	Dynamo Lab.	1	Met. 24	Metallurgy	2
Met. 23	Gen. Metallurgy	2	Met. 84	Met. Problems	1
Met. 83	Met. Problems	1	M.E. 29	Heat Engines	3
Ger. 7	German	3	Geol. 4	Gen. Geology	2
Biol. 52	or Bacteriol.		Geol. 5	Petrology	1
P.E. 5	Physical Ed.	—	P.E. 6	Physical Ed.	—
Lect. 5	Lectures	—	Lect. 6	Lectures	—
		18			18

SUMMER SESSION: M.E. 24, Engineering Laboratory, four weeks, 4.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Chem. 90	Physical Chem.	3	Chem. 91	Physical Chem.	2
Chem. 95	Phys. Chem. Lab.	1	Chem. 96	Phys. Chem. Lab.	1
Chem. 80	Chem. Eng. Lab.	3	Chem. 81	Chemical Eng.	3
C.E. 9	Mech. of Materials	3	Chem. 85	Chem. Eng. Prac.	1
Chem. 92	Electrochemistry	1	Chem. 38	Ind. Org. Anal.	3
Chem. 97	El. Chem. Lab.	1	Chem. 47	Ind. Anal. Conf.	1
Bus. 3	Economics	3	Chem. 99	Research Lab.	2
Chem. 62	Adv. Org. Chem.	2	Chem. 79	History of Chem.	1
P.E. 7	Physical Ed.	—	Bus. 4	Economics	3
			P.E. 8	Physical Ed.	—
		17			17

THE CURRICULUM IN CHEMISTRY

The Chemist needs an uncommonly deep insight into the phenomena of matter, and into the many processes in nature and in the arts in which matter undergoes change. The graduate in chemistry may use his education to discover and investigate, through research, hitherto unknown combinations of matter and of energy, or he may go forward in applying known facts and principles to new and useful purposes in manufacture or in the arts. In preparation for a professional career, the training is arranged to be thorough in fundamentals and to grow to a comprehensive understanding of the scientific and industrial achievements of chemistry.

The curriculum leading to the degree of Bachelor of Science in Chemistry offers an education primarily in chemistry, with considerable training in related sciences. The modern conception of an education in chemistry includes a simultaneous, thorough study of physics and mathematics. In addition to these so-called physical sciences, other studies, planned to aid and develop the thought-processes and culture of the student, are embodied in the curriculum. It is believed by many practicing chemists and chemical engineers that an undergraduate course embracing a liberal allotment of study in the humanities is the best preparation for a successful career both in pure science and in the business application of chemistry.

This curriculum and the Curriculum in Chemical Engineering are both given under the direction of the Department of Chemistry and are administered as part of the College of Engineering. It is readily possible to change from one curriculum to the other at the end of either semester of the sophomore year. The freshman and sophomore years are the same for both curricula. The entrance subjects required are the same for both curricula, and the tuition and laboratory costs are practically the same. Subjects with the same titles in the tabulated curricula are given to students in both curricula simultaneously and under the same teachers, and are equal in content. Further detail of chemistry subjects is given in the description of the Curriculum in Chemical Engineering.

The study of English is carried through the freshman year and is resumed in the junior year. French and German receive considerably more attention in this curriculum than in the Curriculum in Chemical Engineering, as language tools for the working chemist and in their cultural aspects. Students who enter the University with German continue German through the sophomore year and take up French in the junior year. Those who offer French or Spanish as an entrance subject take German through the sophomore and junior years.

The prescribed course in Economics and elective business subjects are given in the College of Business Administration.

Geology is presented from its cultural viewpoint as a science and also in its economic relations. Senior year electives allow of studies in Biology and the related field of Bacteriology, and these with chemistry make an attractive combination toward industrial employment.

Applications of the science of chemistry and the science of physics to industrial chemistry and chemical engineering are treated in the junior and senior years. These courses offer a wide range of purely chemical engineering processes, which, together with description and reading in manufacturing procedure, afford a sound basis for a career in industry. The studies in chemical engineering practice cover the engineering features of a few industrial operations, critically analyzed and controlled under the immediate supervision of an expert. In order to acquaint the student with factory method and personnel, a required summer term of work in factory or laboratory is set for part of the summer following the junior year.

Students of more than average ability and industry are encouraged to enroll in subjects given in the University beyond those listed in the Curriculum in Chemistry.

The foregoing curriculum serves as an excellent preparation for graduate study. Students who desire to go forward to the Master's degree (M.S.) will find information in regard to the requirements for that degree elsewhere in this Register.

THE CURRICULUM IN CHEMISTRY

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Chem. 6	Adv. Chemistry	3	Chem. 7	Adv. Chemistry	3
Chem. 30	Quant. Anal	3	Chem. 31	Quant. Anal	3
Chem. 41	Quant. Anal. Conf.	1	Chem. 45	Quant. Anal. Conf.	1
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Ger. 1 or 5	German	3	Ger. 2 or 6	German	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		19			19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas and Oil Analysis, four weeks, 4.

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 60	Organic Chem.	4	Chem. 61	Organic Chem.	3
Chem. 65	Org. Chem. Lab.	2	Chem. 66	Org. Chem. Lab.	3
Chem. 78	Chem. Eng.	3	Geol. 4	Gen. Geology	2
Bus. 3	Economics	3	Geol. 5	Petrology	1
Eng. 6	English	3	Bus. 4	Economics	3
Ger. 3 Fr. 5	German or French	3	Eng. 7	English	3
P.E. 5	Physical Ed.	—	Ger. 4 Fr. 6	German or French	3
Lect. 5	Lectures	—	P.E. 6	Physical Ed.	—
			Lect. 6	Lectures	—
		18			18

SUMMER: Chem. 50, Work in industrial shops or chemical laboratory for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Chem. 90	Physical Chem.	3	Chem. 91	Physical Chem.	2
Chem. 95	Phys. Chem. Lab.	1	Chem. 96	Phys. Chem. Lab.	1
Chem. 80	Chem. Eng. Lab.	3	Chem. 81	Chemical Eng.	3
Chem. 92	Electrochemistry	1	Chem. 85	Chem. Eng. Prac.	1
Chem. 97	El. Chem. Lab.	1	Chem. 38	Ind. Org. Anal.	3
Chem. 62	Adv. Org. Chem.	2	Chem. 47	Ind. Anal. Conf.	1
Any two of the following:			Chem. 99	Research Lab.	2
			Chem. 79	History of Chem.	1
Biol. 52 Biol. 1 Bus. 25 Met. 23 Met. 83 Phys. 14	Bacteriology Biology Corp. Finance Metallurgy 2 & Met. Prob. 1 Physics	6	Biol. 53 Bus. 18 Met. 24 Met. 84 Phys. 15	Adv. Bacteriol. or Accounting Metallurgy .2 &Met.Prob.1 or Physics	3
P.E. 7	Physical Ed.	—	P.E. 8	Physical Ed.	—
		17			17

THE CURRICULUM IN CIVIL ENGINEERING

The purpose of this curriculum is to give a broad education in those general and scientific subjects which form the foundation of all engineering, and a special training in the field of Civil Engineering, which covers the building of highways, railroads, harbors, docks and terminals, bridges, buildings, foundations, subways, tunnels, water supply and purification plants, sewerage systems and sewage disposal plants, water power development and surveys. The Department aims to teach young men how to think and how to attack new problems, to impress upon them the underlying principles of engineering and to inspire them with the desire to do their best work.

To enable the Civil Engineering graduate to deal with allied engineering problems arising in most civil engineering projects of today, the curriculum includes certain special studies such as dynamos and motors, alternating currents, heat engines, metallurgy, mineralogy and geology. Courses in Business Administration, comprising economics, accounting and finance, have been placed in the curriculum with the idea that the graduate should have a knowledge of the fundamentals of business. These business subjects should prove useful to young graduates whose advancement may be along sales, managerial and executive channels. The Civil Engineering curriculum as a whole, including as it does mathematics, pure and applied science, general engineering and business subjects, affords a thorough training in system, arrangement of work, accuracy in figures and logical thinking, so that the student has the proper training to enter not only the engineering profession, but also any business organization, should he not care to follow strictly engineering work.

The first two years are devoted to fundamental studies which both give general culture and prepare for the technical work of the following years. These studies include the various branches of pure mathematics, physics, chemistry, English, modern languages, drawing, descriptive geometry, mineralogy, geology and military science and tactics.

In the summer session, at the close of the freshman year, Land, Topographic and Railroad Surveying is given. This course covers a period of six weeks, and by this arrangement the attention of students is concentrated upon surveying, thus enabling practical field operations to be exemplified in the best manner. In Geodetic Surveying, given in the senior year, triangulations of a high degree of precision are executed. Determinations of azimuth and adjustments of results are made by standard methods. A large collection of levels, transits and other surveying instruments enables the student to become familiar with the best type of apparatus.

Mechanics of Materials, which presents the theory of beams, columns and shafts, and the method of computing and designing them, is given in the junior year. The course as here presented may be described as applied mechanics: that is, the application of mechanics to practical problems. Materials Testing Laboratory, paralleling Mechanics of Materials, is of great importance for the student's understanding of the mechanics of engineering and for the capacity it gives him to manipulate apparatus and to handle machines. Tests are made on the various materials used in construction.

Buildings and bridges receive attention throughout three semesters. Analytical and graphic methods of determining stresses are taken up in Stresses of the second semester of the junior year and in Structural Steel Design, Bridge and Building Construction, Foundations and Higher Structures of the senior year. Visits are made to bridges and fabricating shops. In the senior year designs and working drawings are prepared by each student for both a highway and a railroad bridge. Some of these drawings are made in the same manner as in drawing rooms of bridge companies and others are general: that is, design drawings only. The theory of cantilever, draw, suspension and arch structures receives detailed attention. Structural Steel Design as applied to building construction is studied in detail. The design and construction of reinforced concrete and foundations are given in the second semester of the senior year in the courses in Reinforced Concrete Design and Foundations. This extended training in structural engineering furnishes a foundation for structural steel and reinforced concrete work in practice.

Hydraulic Engineering and Sanitary Engineering are treated at length. The theory of the flow of water through orifices, weirs, pipes and channels, together with the principles of hydraulic motors, is given in the junior year, the work being supplemented by testing in the hydraulic laboratory. In the senior year the subjects of water supply, water power and sewerage are covered in detail. The methods of collecting, purifying and distributing water are explained and compared; house drainage, the design of sewerage systems and the disposal of sewage also receive attention. Computations of dams, stand-pipes, sewers and other appurtenances are made. Canal engineering, river and harbor work and land drainage are studied; irrigation by both water and sewage are discussed. The training in Hydraulics and sanitary engineering subjects, including Sanitary Bacteriology in the senior year, is planned to enable a graduate to enter upon the work of city engineering. In connection with the course in Hydraulics, measurements are made of the flow of the Lehigh River, the Lehigh Canal and other streams in the vicinity of Bethlehem, and the data thus obtained are studied later and reports written thereon. In view of the increasing importance of water power development, this work is of value and interest.

The course in Highway Engineering covers a general discussion of roads and pavements, a study of traffic, both present and future, routes, financing, engineering and construction. The design of rural highways and city streets is taken up in detail. Materials used in the road metal are discussed and compared, preliminary to a study of selection of type. Tests on both bituminous and non-bituminous materials are made in the Fritz Engineering Laboratory. Illustrated lectures on road materials are given throughout the semester. Inspection trips are made to points nearby, to view and study methods of design and construction.

The course in Railroads covers financing, surveying, economic location and construction, operation, yards, terminals, train resistances and electrification.

During the first semester of the senior year, Contracts and Specifications is presented by the Civil Engineering Department more from the engineering than from the legal viewpoint. This course, consisting of three lectures a week, gives the essential features of contracts and the form and scope of contracts and specifications as used in building engineering work.

During the senior year an inspection trip is made to New York or Philadelphia for the purpose of viewing and studying engineering works, including construction. The trip is required of all students. The minimum expense is about twenty-five dollars.

A description of the Fritz Engineering Laboratory, which is operated by the Civil Engineering Department, is given in this Register under the heading of Buildings.

Graduates of this curriculum receive the degree of Bachelor of Science in Civil Engineering. Mature young men, if properly qualified, may take special studies without being candidates for the degree.

THE CURRICULUM IN CIVIL ENGINEERING

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Geol. 1a	Mineralogy	3	Geol. 4	Geology	2
			Geol. 5	Petrology	1
Eng. 4, 6, 8, 10 or 43 Hist. 13 Biol. 1	English or Foreign Language or History or Biology	3	Eng. 5, 7, 9, 11, 44 or 45 Hist. 14 Psych. 5	English or Foreign Language or History or Psychology	3
C.E. 11	Railroads	3	C.E. 16	Highway Eng.	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Math. 6	Adv. Calculus	3	C.E. 12	Hydraulics	3
C.E. 8	Mech. of Materials	4	C.E. 14	Hydraulics Lab.	1
C.E. 10	Mat. Testing Lab.	1	C.E. 15	Stresses	4
E.E. 50	Dyn. & Motors	2	Math. 21	Anal. Mechanics	3
E.E. 51	Dynamo Lab.	1	E.E. 52	Alt. Currents	2
M.E. 29	Heat Engines	3	E.E. 53	Dynamo Lab.	1
Bus. 3	Economics	3	M.E. 19	Engineering Lab.	1
P.E. 5	Physical Ed.	—	Bus. 4	Economics	3
Lect. 5	Lectures	—	P.E. 6	Physical Ed.	—
			Lect. 6	Lectures	—
		17			18

SUMMER: C.E. 29, Industrial employment for eight weeks on construction or in shop, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
C.E. 18	Str. Steel Design.	4	C.E. 25	Reinf. Concrete	3
C.E. 19	Br. & Bldg. Constr.	2	C.E. 26	Cem. & Con. Lab.	1
C.E. 28	Sanitary Eng.	3	C.E. 25a	Foundations	2
C.E. 21	Hyd. & W.P. Eng.	4	Biol. 50	Sanitary Bac.	3
Bus. 25	Corp. Finance	3	Eng. 9	English	3
Psych. 5	or Psychology		Met. 24	or Met. 2	
Biol. 1	or Biology		Met. 84	& Met. Prob. 1	
C.E. 27	or Con. & Spec.		Bus. 18	Accounting	3
Met. 21	Metallurgy 2	3	C.E. 23	R.R. & Term.	3
Met. 81	& Met. Prob. 1		C.E. 24	or Higher Structures.	
Astr. 2	or Astronomy		C.E. 22	or Geodesy	
Math.†		—	Astr. 3	or Prac. Astr.	
P.E. 7	Physical Ed.	—	C.E. 31	or Adv. San. Eng.	
			C.E. 32	or Adv. Hwy. Eng.	
			C.E. 50	Thesis*	—
			Math.†		—
			P.E. 8	Physical Ed.	—
		19			18

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* Thesis may be taken only by students of outstanding ability; and in the majority of such cases it can be carried as an extra subject, not only in the second semester but also in the first.

† Students who have completed Math 21 with high standing may elect Math 11, 12, 22, 23 or 24 on approval of the Director of the Curriculum.

THE CURRICULUM IN ELECTRICAL ENGINEERING

The Electrical Engineer is one who understands the science and art of utilizing electricity. He may design, manufacture, install and operate electrical machinery and appliances, manage plants and electric systems, or engage in the promotion of engineering projects. The demand for trained electrical engineers continues to grow faster than the supply. The graduate has a wide choice among the varied and increasing applications of electricity and promotion for the deserving is rapid.

The object of this curriculum is to give a broad education in those general and scientific subjects which underlie all the branches of engineering, and to give special training in those technical and business subjects which experience shows are most essential in the equipment of the electrical engineer. In seeking to accomplish this object the Department puts chief emphasis upon mastery of principles and thoroughness in the analysis of problems.

The curriculum includes a number of special studies in civil, mechanical and metallurgical engineering, so that the graduate in Electrical Engineering is prepared not only to enter any of the branches of electrical engineering but also to deal with related problems in the other divisions of engineering. The electrical engineering graduate of today finds that professional advancement often lies through commercial, managerial or executive channels. As superintendent or manager of electric light, power or railway properties he must be prepared to handle problems involving not merely material and technical details but human relations, with workmen, capitalists, public utility commissioners and the public. He must know something of the principles of accounting, economies, business law and industrial management. A number of such studies have been introduced into the curriculum.

The fundamental studies are given in the early part of the course and include mathematics, physics, chemistry, English, and a continuation of the modern language accepted for entrance. These subjects include the more essential features of a broad education, and they furnish a preparation for the more advanced scientific and technical training to follow.

Work in applied electricity is pursued through the sophomore year in the study of Electric Distribution and Direct Current Machinery, with Dynamo Laboratory. The junior and senior years are devoted almost exclusively to advanced technical work.

During the vacation following the junior year students are required to spend at least eight weeks in an electrical industrial plant or station; a written report on this work is made at the beginning of the next college year.

The study of Electricity and Magnetism constitutes an introduction to the industrial applications of electricity. Electric Distribution makes immediate application of electrical theory to the calculation of lighting and power circuits.

The study of Dynamos and Motors includes the construction, operation and control of direct current generators and motors, with numerous illustrative problems. The study of dynamo electric machinery is resumed during the senior year in connection with the subjects of Electrical Design and Alternating Current Machinery.

Fundamental subjects in mechanical engineering are required in this curriculum. Heat Engines includes the study of steam boilers, thermodynamics, steam engines, turbines and gas engines. Engineering Laboratory is given throughout the senior year.

Important studies in civil engineering are included in this curriculum. Mechanics of Materials is concerned with the theory of beams, columns, and shafts and the method of computing and designing them; the subject includes practical work in the testing laboratory. Hydraulics, including laboratory practice, treats of hydrostatics and theoretical hydraulics, the flow of water through orifices, weirs, pipes and channels, naval hydromechanics and hydraulic motors.

The study of General Metallurgy and Metallurgical Problems is given during the first term of the sophomore year.

Advanced studies in electrical engineering follow the Electric Distribution, Direct Current Machinery, and Electricity and Magnetism of the sophomore year. The advanced electrical laboratory work is devoted to precise electrical measurements and the standardization and calibration of electrical measuring instruments. The Theory of Alternating Currents deals with the problems and methods of measurements which are peculiar to the modern practical applications of alternating currents and with the theory underlying the action of the important types of alternating current machinery and transmission lines. Alternating Current Machinery includes the study of the construction and operation of alternating current generators, motors, transformers, and other apparatus.

Dynamo laboratory work, beginning in the second semester of the sophomore year, is continued for five semesters. Instruction is based on a laboratory manual or notes supplemented by individual direction and supervision in the laboratory. The students work individually or in pairs, and make the more important tests on direct and alternating current generators and motors, rotary converters, transformers, and other electrical apparatus. Written reports of all tests made, with curves plotted from the observations and discussion of results, are required. Throughout these courses the student is trained not only to perform the experimental work but also to plan and direct it.

Electrical Design is taken in the first semester of the senior year. It includes the application of electric, magnetic and mechanical principles to the design of various types of electrical apparatus. The instruction is given by recitations, problems and drafting.

Electrical Engineering Seminar continues throughout the senior year. The work consists of the presentation before the class of papers on assigned topics, supplementing the regular work of the class room, and of reports on their work. The Department reading-room is supplied with the leading electrical periodicals, American and foreign. One of the principal objects of the Seminar work is to encourage the systematic reading of the current engineering journals.

Dynamo Testing, given by lectures and problems, treats of standard and special methods of making tests on dynamo machines, transformers, and other electrical apparatus.

Electric Stations takes up the location, design, and equipment of stations, the selection of suitable prime movers, generators, switchboards, and other apparatus. The cost of generating electric power and the various systems of determining rates receive consideration.

Under Electric Traction are studied the construction, equipment and operation of different types of electric railways. The recent developments in the application of electric motive power to steam railroad conditions are discussed, and the results of tests are analyzed.

The subject of Electric Power Transmission deals with the various elements constituting a transmission system. It includes a study of the generating plant, the transmission line and the receiving systems. Special attention is given to the design, construction and protection of the line. In the senior year a trip is taken to New York and vicinity on which visits of inspection are made to power plants, electrical laboratories and telephone exchanges located in or about the city. This trip is required of all students who are candidates for a degree. The minimum expense is about $25.

Electric Communication deals with telephone and telegraph systems, with special emphasis on matters of radio telegraphy and telephony, including the theory and operation of vacuum tube circuits. The laboratory work given in connection with this course includes the study of telephone transmission over an artificial telephone line and practical tests on the various radio circuits and apparatus.

Electric Transients deals with the transient phenomena occurring in the operation of generators, transformers and transmission circuits and the relations of these phenomena to the protection of electric systems and apparatus.

Graduates of this curriculum receive the degree of Bachelor of Science in Electrical Engineering.

THE CURRICULUM IN ELECTRICAL ENGINEERING

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Eng. 4, 6, 8, 10 or 43	English or Foreign Language	3	M.E. 23	Heat Engines	3
Met. 21	Metallurgy	2	Eng. 5, 7, 9, 11, 44 or 45	English or Foreign Language	3
Met. 81	Met. Problems	1	E.E. 2	Direct Cur. Mach.	3
E.E. 1	Elec. Distribution	1	E.E. 3	Elem. Dyn. Lab.	1
M.E. 22	Heat Engines	3	Mil. 4	M. S. & T.	2
Mil. 3	M. S. & T.	2	E.C. 4	Eng. Conferences	—
E.C. 3	Eng. Conferences	—	P.E. 4	Physical Ed.	—
P.E. 3	Physical Ed.	—	Chap. 4	Chapel	—
Chap. 3	Chapel	—	Lect. 4	Lectures	—
Lect. 3	Lectures	—			
		19			19

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Math. 6	Adv. Calculus	3	Math. 21	Anal. Mechanics	3
E.E. 4	Alt. Currents	3	E.E. 6	Alt. Currents	3
E.E. 5	Inter. Dyn. Lab.	1	E.E. 8	Inter. Dyn. Lab.	1
Phys. 10	Adv. Elec. Lab.	1	E.E. 9	Dyn. Testing D.C.	1
C.E. 9	Mech. of Materials	3	Phys. 11	Electrical Lab.	1
C.E. 10	Mat. Testing Lab.	1	C.E. 13	Hydraulics	2
Biol. 1	Biology	3	C.E. 14	Hydraulics Lab.	1
Bus. 3	Economics	3	Geol. 4 Geol. 6 Psych. 5	Gen. Geol. 2 Geology Trips. 1 or Psychology	3
P.E. 5	Physical Ed.	—	Bus. 4	Economics	3
Lect. 5	Lectures	—	P.E. 6	Physical Ed.	—
			Lect. 6	Lectures	—
		18			18

SUMMER: E.E. 24, Industrial employment for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
E.E. 12	A.C. Machinery	3	E.E. 18	Elec. Power Trans.	3
E.E. 10	Dyn. Testing A.C.	1	E.E. 19	Adv. Dyn. Lab.	2
E.E. 11	Adv. Dyn. Lab.	3	E.E. 16	Elec. Seminar	2
E.E. 14	Elec. Stations	2	M.E. 25	Engineering Lab.	1
M.E. 21	Engineering Lab.	1	Bus. 18	Accounting	3
E.E. 21 E.E. 13 E.E. 23	Elec. Com. or Elec. Design or Thesis*	3	Any two of the following:		
Bus. 25 Eng. 4 or 29. Hist. 13	Corp. Finance or English* or History	3	E.E. 20 E.E. 22 E.E. 23 Eng. 5 or 30	Elec. Traction Elec. Transients Thesis* English*	6
E.E. 15	Elec. Seminar	1	Math.†		—
Math.†		—	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		17			17

* If elected, to be taken for one term only.

† Students who have completed Math 21 with high standing may elect Math 11, 12, 22, 23 or 24 on approval of the Director of the Curriculum.

THE CURRICULUM IN ENGINEERING PHYSICS

The purpose of the curriculum in Engineering Physics is to train young men so that, upon graduation, they may be fitted to enter an industrial research laboratory and be able to attack problems in engineering development, for the study and solution of which these laboratories are designed.

Since physics, particularly in the last decade, has become the principal foundation upon which engineering development is based, this curriculum includes a total of forty-two hours in physics, and as the language of physics is mathematics, this science is continued through the four years of the curriculum.

In order that the student may have the engineering slant, courses in civil, mechanical and electrical engineering subjects are included.

There is in this curriculum a liberal inclusion of subjects which have a broadening and humanizing value, the object being, as far as may be, to provide the graduate with a more liberal education than he would obtain were he to devote his time to the study of science and engineering alone. Thus it will be seen that courses in economics and elective courses in history, psychology, business, biology or geology, etc., are included.

To enable the student to have a fair ability to read scientific literature in French or German, courses in these modern languages are included.

The courses of study in the freshman year, uniform with those of the other engineering curricula, are described elsewhere in the Register.

In the first semester of the sophomore year, physics is continued in the more advanced study of mechanics, heat and light (Phys. 4) and in a further and more advanced study of special topics of classical physics (Phys. 14). This latter course is optional with Advanced Chemistry (Chem. 6) with the advice and consent of the Director of the Curriculum.

In the second semester of this year, electricity, magnetism and sound (Phys. 6) are treated in a more advanced manner than in the freshman year and great stress is laid on the solution of numerous problems in these subjects. A non-mathematical introduction to Contemporary Physics (Phys. 15) is optional with the continuation of Advanced Chemistry (Chem. 7).

Throughout the year, laboratory courses are given in Mechanics, Heat, Electricity, Light and Sound (Phys. 5 and 7). The experiments performed are of a more advanced nature than those of the freshman year and greater stress is laid on the precision of the results obtained.

An introductory course in the Mathematical Theory of Physics is given throughout the junior year (Phys. 16 and 17) and in the first semester, a course in Advanced Electricity and Magnetism (Phys. 8). A free use of calculus is made in these courses, and the student begins to learn the application of mathematics to physics.

The laboratory work accompanying the foregoing courses (Phys. 10, 11, 18 and 19) is designed to inculcate the spirit, methods and technique of physical research. The student is expected to develop resourcefulness and initiative in these laboratories and he therefore receives instruction more in the form of advice than in specific directions.

Industrial employment, preferably in an industrial research laboratory, for a minimum of eight weeks, is required in the summer term. A written report on this work is submitted upon its completion.

The theory of electric oscillations and electric waves and of high frequency phenomena (Phys. 20) is taught in the first semester of the senior year. This subject is of prime importance in all problems pertaining to electric communication, both wired and wireless, and in the study of transient phenomena in transmission lines. The course is accompanied by laboratory work (Phys. 21). The study of Physical Optics and Spectroscopy (Phys. 22) together with its accompanying laboratory work (Phys. 23) is also included in this semester.

In the second semester, the student gains an insight into the properties of gaseous ions, vacuum tube phenomena, resonance potentials, and photo-electricity, through the study of electric discharges through gases (Phys. 24). This course is accompanied by laboratory work (Phys. 25). In this semester also, an advanced course in Heat with laboratory exercises, (Phys. 26 and 27), based upon the theoretical study of thermodynamics and heat radiations is taught.

Throughout the senior year the work in the various laboratories becomes more and more of the research type and the student is required to depend on his own initiative to the greatest extent possible.

The graduates of this curriculum receive the degree of Bachelor of Science in Engineering Physics.

THE CURRICULUM IN ENGINEERING PHYSICS

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
Ger. 1 or 5	German	3	Ger. 2 or 6	German	3
Bus. 3	Economics	3	Bus. 4	Economics	3
Phys. 14	Physics	3	Phys. 15	Physics	3
Chem. 6	or Adv. Chem.		Chem. 7	or Adv. Chem.	
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Math. 6	Adv. Calculus	3	Math. 21	Anal. Mechanics.	3
Phys. 8	Adv. Elec. & Mag.	2	Phys. 17	Intr. Theo. Phys.	3
Phys. 10	Electrical Lab.	1	Phys. 19	Lab. Physics	2
Phys. 16	Intr. Theo. Phys.	2	Phys. 11	Electrical Lab.	1
Phys. 18	Lab. Physics	1	Ger. 4	German	3
E.E. 50	Dyn. & Motors 2	3	Fr. 4	or French	
E.E. 51	& Dyn. Lab. 1		E.E. 52	Alt. Currents. 2	3
M.E. 22	or Heat Eng.		E.E. 53	& Dyn. Lab. 1	
Ger. 3	German	3	M.E. 23	or Heat Eng.	
Fr. 3	or French		Eng. 9	Adv.Composition	3
Eng. 8	Adv.Composition	3	Psych. 9	or Psychology	
Psych. 5	or Psychology		Hist. 14	or Histroy	
Hist. 13	or Histroy		Govt. 52	or Amer. Govt.	
Govt. 51	or Amer. Govt.		Bus. 12	or Accounting	
Bus. 11	or Accounting		Bus. 22	or Corp. Fin.	
Bus. 21	or Corp. Fin.		P.E. 6	Physical Ed.	—
P.E. 5	Physical Ed.	—	Lect. 6	Lectures	—
Lect. 5	Lectures	—			
		18			18

SUMMER: Phys. 50, Industrial employment for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Math. 11	Adv. Dif. Eq.	3	Math. 12	Adv. Dif. Eq.	3
Phys. 20	Elec. Waves	3	Phys. 24	Elec. Dis. in Gases	2
Phys. 21	Physics Lab.	1	Phys. 25	Physics Lab.	1
Phys. 22	Optics & Spec.	3	Phys. 26	Heat	2
Phys. 23	Physics Lab.	1	Phys. 27	Physics Lab.	1
C.E. 9	Mech. of Materials	3	Geol. 4	Gen. Geology	2
C.E. 10	Mat. Testing Lab.	1	Geol. 6	Geol. Trips	1
Bus. 39	Ind. Management	3	E.E. 22	Elec. Transients.	3
Bus. 56	or Bus. Law.		Educ. 2	Hist. of Educ.	3
Biol. 1	or Biology		Bus. 56	or Bus. Law.	
Math.†		—	Biol. 2	or Biology	
P.E. 7	Physical Ed.	—	Math.†		—
			P.E. 8	Physical Ed.	—
		18			18

† Students who have completed Math 21 with high standing may elect Math. 22, 23 or 24 on approval of the Director of the Curriculum.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

Industrial Engineering has to do with the organization, operation and management of manufacturing plants, public utilities, and operating, holding and management companies. Broadly considered it covers the engineering aspects of plant location, plant layout, routing, production control, maintenance, stores and inspection; the economic aspects of employment, employee training, promotion, wage payment, bonus, safety and welfare, insurance and old age pensions; and the commercial aspects of purchasing, marketing, credit, accounting and finance.

Industrial enterprises depend on sound financing, adequate accounting and intelligent forecasting of economic developments. Technical skill and engineering efficiency are primary requisites, but these alone are not sufficient. There is a demand by industry for men who have not only a thorough training in the fundamentals of engineering, but also a knowledge of the problems of accounting, finance, statistics and management which every enterprise encounters. To add to the technical knowledge, fine mental discipline and scientific spirit that come from engineering study, a knowledge of the basic facts of economics, finance and management is the objective of the Curriculum in Industrial Engineering.

Long known for its high standards in engineering education, Lehigh University has devised the curriculum in Industrial Engineering with the maintenance of these standards as the first consideration. This curriculum is based upon the principle that such a curriculum must be primarily an engineering curriculum, with sufficient work in engineering to make the graduate at home in a highly technical environment. Approximately two-thirds of the four years' work is selected from the basic and essential courses in Mechanical, Civil and Electrical Enginering. The remaining third is selected from the major courses in economics and business administration, so chosen as to provide a thorough training in the fundamental principles of economics, industrial management, corporation financing and business practice. It is hoped that the curriculum will meet the needs of that considerable body of students who intend to enter industries essentially technical, whether public utilities or manufacturing plants, but who intend to go into the administrative departments.

The work of the first year is identical with that of all other engineering curricula in the University and includes mathematics, chemistry, physics, English, drawing and military science. Students in this curriculum take the summer course in Land and Topographic Surveying at the end of the freshman year.

During the sophomore year, students in this curriculum continue with mathematics and physics. They also begin the engineering work with elementary machine design and the business work with economics. Those who elect the advanced course in military science and tactics attend the Military Training Camp during the summer following the sophomore year.

During the junior year the work is evenly divided between engineering and business, three courses in each field of study being carried throughout the year. At the end of the junior year students work a minimum of eight weeks in an industrial plant and turn in a report, typewritten and bound.

In the senior year the work consists of two engineering courses, three business courses and a free elective which may be in either engineering or business, as the student may elect.

In the senior year a maximum of three half-day inspection trips per semester are required of all candidates for a degree. These trips are made to the industries in the vicinity of the University, for the purpose of studying the application of the principles of scientific management. They are scheduled by the professor teaching the course in Industrial Management as a part of the work of that course. Reports are required. When these trips interfere with other rostered work, excuses for absences will be provided as on inspection trips.

Graduates of this curriculum receive the degree of Bachelor of Science in Industrial Engineering.

THE CURRICULUM IN INDUSTRIAL ENGINEERING

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
Eng. 4, 6, 8, 10 or 43 Govt. 51	English or Foreign Language or Amer. Govt.	3	Eng. 5, 7, 9, 11, 44 or 45 Govt. 52	English or Foreign Language or Amer. Govt.	3
Bus. 3	Economics	3	Bus. 4	Economics	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
M.E. 30	Mechanism	3	E.E. 50	Dyn. & Motors	2
C.E. 9	Mech. of Materials	3	E.E. 51	Dynamo Lab.	1
M.E. 22	Heat Engines	3	C.E. 13	Hydraulics	2
Bus. 11	Accounting	3	C.E. 14	Hydraulics Lab.	1
Bus. 21	Corp. Finance	3	M.E. 23	Heat Engines	3
Bus. 29	Money & Banking	3	Bus. 12	Accounting	3
P.E. 5	Physical Ed.	—	Bus. 22	Corp. Finance	3
Lect. 5	Lectures	—	Bus. 30	Money & Banking	3
			P.E. 6	Physical Ed.	—
			Lect. 6	Lectures	—
		18			18

SUMMER: M.E. 27, Work in industrial plant for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER Number	Title	Cr.Hrs.	SECOND SEMESTER Number	Title	Cr.Hrs.
E.E. 52	Alt. Currents	2	E.E. 54	Electrical Eng.	2
E.E. 53	Dynamo Lab.	1	E.E. 55	Dynamo Lab.	1
M.E. 10	Thermodynamics.	3	Met. 21	Metallurgy	2
Bus. 39	Ind. Management	3	Met. 81	Met. Problems	1
Bus. 45	Statistics	3	Bus. 40	Ind. Management	3
Bus. 33	Labor	3	Bus. 56	Business Law	3
	Electives	3	Bus. 26	Pub. Finance	3
P.E. 7	Physical Ed.	—		Elective	3
			P.E. 8	Physical Ed.	—
		18			18

THE CURRICULUM IN MECHANICAL ENGINEERING

Mechanical Engineering has to do with the conversion of the energy latent in coal into heat for warming our houses and cooking our food; into mechanical energy for operating our factories and propelling our trains, automobiles, steamships and aeroplanes; into electrical energy for turning our motors and lighting our houses. Likewise it has to do with the design, construction, installation and operation of the machinery necessary for the economical and advantageous uses of power and with the management of the industries and organizations manufacturing and using power-driven equipment.

The young graduate ordinarily goes into a graduate apprenticeship in some public utility, manufacturing or selling organization, from which he may work up to a position as power engineer, works manager or sales engineer.

The curriculum in Mechanical Engineering is arranged to afford a comprehensive, rigorous training in the analysis of those fundamental scientific principles which form the basis of the design of apparatus and machinery, the equipment and operation of industrial plants and the production and utilization of power.

The work of the freshman year is identical with that of the other engineering curricula at the University. Immediately following the freshman year, students electing mechanical engineering take the course in Land and Topographic Surveying at the surveying camp, which is conducted as part of the Summer Session.

During the sophomore year a choice between English and foreign language is offered, freshman drawing gives way to elementary machine design, and freshman chemistry is replaced by an elementary course in Heat Engines. Otherwise the work is strictly a continuation of the courses taken in the freshman year. At the end of the sophomore year, students electing the advanced work in Military Science and Tactics attend the Reserve Officers' Training Corps Camp for a period of six weeks.

In the junior year the work in mathematics is completed, the study of heat is continued as Thermodynamics and Heat Engines, both supplemented by laboratory courses, and design is continued as Mechanism. The study of Metallurgy and Mechanics of Materials is completed during the first semester. Work in the College of Business Administration begins in the first semester and continues throughout the junior and senior years. Work in Electrical Engineering is inaugurated in the second semester and continues throughout the senior year. At the close of the junior year, students work for eight weeks during the summer, in industrial plants, on student apprenticeship work or on engineering construction as approved by the department. A report, typewritten and bound, is required.

During the senior year the work is broadly distributed. In addition to the major Mechanical Engineering courses, work is prescribed in the departments of Civil and Electrical Engineering, and in the College of Business Administration. During the second semester students normally take English, although provision is made for Thesis or elective as approved by the department.

Students taking any of the courses in Engineering Laboratory are subject to call for duty on a maximum of one twenty-four hour test per semester. When such duty interferes with scheduled exercises, excuses for absences will be provided as on inspection trips.

In the senior year one trip is taken to New York or Philadelphia, during which visits of inspection are made to power plants, municipal works, ship yards and a variety of industrial plants located in these cities or the vicinity. This trip is required of all students who are candidates for a degree. The minimum expense is about twenty-five dollars.

Graduates of this curriculum receive the degree of Bachelor of Science in Mechanical Engineering.

THE CURRICULUM IN MECHANICAL ENGINEERING

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab.	1	Phys. 7	Physics Lab.	1
M.E. 1	Elem. Mach. Des.	3	M.E. 4	Elem. Mach. Des.	3
Eng. 4, 6, 8, 10 or 43	English or Foreign Language	3	Eng. 5, 7, 9, 11, 44 or 45	English or Foreign Language	3
M.E. 2	Elem. Heat Eng.	3	M.E. 5	Elem. Heat Eng.	3
Mil. 3	M. S. & T.	2	Mil. 4	M. S. & T.	2
E.C. 3	Eng. Conferences	—	E.C. 4	Eng. Conferences	—
P.E. 3	Physical Ed.	—	P.E. 4	Physical Ed.	—
Chap. 3	Chapel	—	Chap. 4	Chapel	—
Lect. 3	Lectures	—	Lect. 4	Lectures	—
		18			18

SUMMER: Mil. 9 or 19, Reserve Officers' Training Corps Camp, for those who elect Advanced Military Science and Tactics, 3.

JUNIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
Math. 6	Adv. Calculus	3	Math. 21	Anal. Mechanics	3
Met. 21	Metallurgy	2	E.E. 50	Dyn. & Motors	2
Met. 81	Met. Problems	1	E.E. 51	Dynamo Lab.	1
C.E. 9	Mech. of Materials	3	M.E. 6	Mechanism	4
C.E. 10	Mat. Testing Lab.	1	Bus. 4	Economics	3
Bus. 3	Economics	3	M.E. 8	Heat Engines	3
M.E. 10	Thermodynamics.	3	M.E. 11	Engineering Lab.	1
M.E. 9	Engineering Lab.	1	Met. 34	Metallurgy Lab.	1
Met. 33	Metallurgy Lab.	1	P.E. 6	Physical Ed.	—
P.E. 5	Physical Ed.	—	Lect. 6	Lectures	—
Lect. 5	Lectures	—			
		18			18

SUMMER: M.E. 27, Work in industrial plant for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER			SECOND SEMESTER		
M.E. 12	Adv. Design	4	M.E. 16	Adv. Design	4
E.E. 52	Alt. Currents	2	E.E. 54	Electrcial Eng.	2
E.E. 53	Dynamo Lab.	1	E.E. 55	Dynamo Lab.	1
C.E. 13	Hydraulics	2	Eng. 9 M.E. 15	English or Thesis or approved Elective	3
C.E. 14	Hydraulics Lab.	1	Bus. 26	Pub. Finance	3
Bus. 11	Accounting	3	M.E. 18	Engineering Lab.	2
M.E. 13	Adv. Mech. Eng.	3	M.E. 17	Adv. Mech. Eng.	3
M.E. 14	Engineering Lab.	2	Math.†		—
Math.†		—	P.E. 8	Physical Ed.	—
P.E. 7	Physical Ed.	—			
		18			18

† Students who have completed Math 21 with high standing may elect Math 11, 12, 22, 23 or 24 on approval of the Director of the Curriculum.

THE CURRICULUM IN METALLURGICAL ENGINEERING

The object of this curriculum is the preparation of the student for practice in the fields of metallurgy. These cover two general types of practice, namely: the production, refining and preparation for sale of the metals, such as iron, steel, copper, lead, zinc, aluminium, etc., and the intelligent use of metals and alloys in industries, for structures, railroads, automobiles, machinery, vehicles, pipe, tools, hardware, ordnance, wire products, etc. Since metallurgists are employed in almost every great industry, it is recognized that broad training is demanded. Emphasis is thereore laid on the thorough training of the student in fundamentals, and the curriculum is planned to be as general, fundamental and broad as the requisite amount of metallurgical training will permit. It is a fairly simple matter for a man thoroughly grounded in fundamental theory to make the necessary applications to actual practice when the need arises, but if his knowledge is purely practical the acquisition of theory is a more difficult achievement.

The foundation of a course in metallurgical engineering must be a thorough training in mathematics, chemistry, physics, economics, English, and one or two foreign languages. A large portion of the first two years of the curriculum is devoted to these subjects, while the last two years are given mainly to their application in the various technical subjects and in industry.

Collateral studies in other departments than metallurgy are liberally provided, such as Mechanical Drawing, Surveying, Descriptive Geometry, Mechanics of Materials and Hydraulics, including laboratory, in the Department of Civil Engineering; Electricity and Magnetism and Electrical Laboratory in the Department of Physics; Alternating Currents, Dynamos and Motors, Electrical Engineering and Dynamo Laboratory in the Department of Electrical Engineering; Heat Engines, comprising the study of thermodynamics, boilers, steam engines, gas engines and internal combustion motors, and Engineering Laboratory, in the Department of Mechanical Engineering; Mineralogy, General Geology and Economic Geology in the Department of Geology; and Ore Dressing in the Department of Mining Engineering.

Instruction is given in English composition and public speaking, and in writing metallurgical reports. German and French are given in the sophomore year. The one year of either German or French is supplemented in the senior year by a course of study in metallurgical literature in German and French with the staff of the Department of Metallurgy.

The studies in chemistry, which are so important to the metallurgist, include Laboratory Experiments, Qualitative and Quantitative Analysis, both gravimetric and volumetric, of the more common ores and metallurgical products, including Gas Analysis and Assaying, along with courses in Stoichiometry and Advanced Chemistry. This instruction, together with the courses in Physics and Physics Laboratory, constitutes the foundation on which the metallurgical instruction is based.

The special instruction in Metallurgy includes lectures on the production of metals, followed by a discussion of their economic and industrial importance and their physical and chemical properties, including statistics of their production and details concerning the distribution of their ores and the geographical distribution and conditions of their production. Courses of lectures extending over three years take up in detail the general principles of metallurgy and their applications to specific cases. The first course treats of the general physical and chemical principles utilized in extracting metals from their ores and the manner in which they are applied, and is followed by a course on the Metallurgy of Iron and Steel, and by another course on the metallurgy of the other metals, copper, lead, silver, gold, etc., in which each metal is discussed in detail. A course of lectures follows on the principles of electrochemistry and their application in electrometallurgy, accompanied by laboratory investigations of these principles as well as the general principles of metallurgical processes, including methods of making physical and chemical measurements which are of value to the practicing metallurgist. A course in Metallography acquaints the student with the methods of studying the physical properties, constitution and structure of metals and alloys with the microscope, pyrometer and other instruments of precision. The seminar in the senior year is intended to bring together the members of the Dpartment and the students in the discussion of current metallurgical questions and problems, and especially to give facility in presenting data to others in clear, concise and forceful English. Metallurgical articles in English and foreign languages are abstracted and presented. The student's presentation is criticised by his fellows and instructors.

In order to impress metallurgical principles upon the student's mind and in order to accomplish the most difficult of all teaching achievements, making the student think, the course includes a series of problems dealing with practical details of the metallurgical processes in an exact and quantitative manner, the data whenever possible being taken from every-day commercial practice, so that the results may give an insight into the quantitative relations that are fundamental to all metallurgical processes.

Information is crystallized in the minds of the students by laboratory exercises in which they are required to study the principles of chemical, physical and mechanical metallurgy. Instruction is given in connection with this laboratory work with the object of teaching and encouraging the practice and application of research in metallurgy. The course is planned to emphasize the principles and subordinate time-consuming manual operations. The course employs laboratory apparatus and is preliminary to work, during which the students often have to apply the underlying principles they are studying to full-size operations and furnaces in commercial metallurgical work and foundries.

Through the kindness of the officials of the Bethlehem Steel Company, the students spend a total of about fifteen to twenty afternoons of three hours each in the steel works, studying the operations in detail under the guidance of instructors, there being not more than six students to each instructor. These visits are co-ordinated with a conference period; the students are informed in advance just what subjects are to be studied during each visit, and are required to report thereon in writing or orally. Visits of inspection are also made to other metallurgical works and industrial plants, such as smelters and refineries of copper, lead, gold, silver and zinc. Plants where heat treating of metals and alloys is practiced in an unusually well-developed manner are also visited. Plants visited in 1926-1927 included the U. S. Metals Refining Company, the American Smelting & Refining Company, the By-Product Coke Plant of the Bethlehem Steel Company, the Plants and Research Laboratory of the New Jersey Zinc Company, the Hyatt Roller Bearing Company, the Philadelphia Navy Yard, the Naval Aircraft Factory, and others. The students also spend part of one summer vacation working in a metallurgical plant, but it is believed that employment activity of college students does not give the same facility in applying principles or the same keenness of observation as work under the immediate direction of instructors. In individual cases, however, so-called "industrial co-operative courses" have been arranged for special and graduate students.

Graduates of this curriculum receive the degree of Bachelor of Science in Metallurgical Engineering.

THE CURRICULUM IN METALLURGICAL ENGINEERING

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER			SECOND SEMESTER		
Number	*Title*	*Cr.Hrs.*	*Number*	*Title*	*Cr.Hrs.*
Math. 4	Elem. Calculus	3	Math. 5	Appl. Calculus	3
Phys. 4	Mech., Heat & Light	3	Phys. 6	Elec., Mag. & Sound	3
Phys. 5	Physics Lab	1	Phys. 7	Physics Lab	1
Geol. 1a	Mineralogy	3	Met. 1	Gen. Metallurgy	2
Chem. 33	Quant. Anal	3	Met. 61	Met. Problems	1
Chem. 44	Quant. Anal. Conf.	1	Chem. 35	Quant. Anal. 3	4
Eng. 8	Adv. Composition	3	Chem. 46	& Quant. Conf. 1	
Ger. 1 or 3	or German		Geol. 4	or Gen. Geol. 2	
Fr. 1	or French		Geol. 5	& Geol. Trips 1	
Span. 1	or Spanish		Geol. 6	& Petrology. 1	
Bus. 3	or Economics.		Ger. 2 or 4	German	3
Mil. 3	M. S. & T.	2	Fr. 2	or French	
E.C. 3	Eng. Conferences	—	Span. 2	or Spanish	
P.E. 3	Physical Ed	—	Bus. 4	or Economics.	
Chap. 3	Chapel	—	Bus. 18	or Accounting	
Lect. 3	Lectures	—	Mil. 4	M. S. & T.	2
			E.C. 4	Eng. Conferences	—
			P.E. 4	Physical Ed	—
			Chap. 4	Chapel	—
			Lect. 4	Lectures	—
		19			19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas and Oil Analysis, four weeks, 4; or Met. 48, Industrial employment for eight weeks, with report; or Mil. 9 or 19, Reserve Officers' Training Corps Camp for those who elect Advanced Military Science and Tactics.

JUNIOR YEAR

FIRST SEMESTER

Met. 2	Met. of I. & S.	2
Met. 62	Met. Problems	1
Met. 5	Electrochemistry	1
Met. 35	El. Chem. Lab.	1
M.E. 22	Heat Engines	3
C.E. 9	Mech. of Materials	3
C.E. 10	Mat. Testing Lab.	1
Any two of the following:		
Mine. 3	Ore. Dr. & Lab.	6
Chem. 6	Adv. Chemistry	
Bus. 3	Economics	
P.E. 5	Physical Ed.	—
Lect. 5	Lectures	—
		18

SECOND SEMESTER

Met. 6	Electrometallurgy	1
Met. 30	Physical Met.	2
Biol. 51	or San. Bact.	
C.E. 13	Hydraulics	2
C.E. 14	Hydraulics Lab.	1
E.E. 50	Dyn. & Motors	2
E.E. 51	Dynamo Lab.	1
M.E. 23	Heat Engines	3
Any two of the following:		
Geol. 8	Econ. Geology	6
Chem. 7	Adv. Chemistry	
Bus. 4	Economics	
Bus. 18	Accounting	
P.E. 6	Physical Ed.	—
Lect. 6	Lectures	—
		18

SUMMER: Met. 49, Industrial employment for eight weeks, with report.

SENIOR YEAR

FIRST SEMESTER

Met. 31	Metallography	2
Met. 3	Met. of Copper, Lead, Gold & Silver	2
Met. 63	Met. Problems	1
Met. 39	Seminar	3
E.E. 52	Alt. Currents	2
E.E. 53	Dynamo Lab.	1
M.E. 19	Engineering Lab.	1
Bus. 53	Business Law	2
Psych. 4a	Psychology	3
Bus. 25	or Corp. Fin.	
Chem. 6	or Adv. Chem.	
Phys. 9	or Adv. El. & Mag. 2	
Phys. 10	& Elec. Lab. 1	
P.E. 7	Physical Ed.	—
		17

SECOND SEMESTER

Met. 4	Met. of Zinc, Aluminium, etc.	2
Met. 64	Met. Problems	1
Met. 32	Metallurgy Lab.	3
Met. 40	Seminar	2
E.E. 54	Electrical Eng.	2
E.E. 55	Dynamo Lab.	1
Any two of the following:		
Chem. 7	Adv. Chemistry	6
Geol. 8	Econ. Geology	
M.E. 30	Mechanism	
Bus. 8	Adv. Economics	
Phys. 15	Modern Phys.	
P.E. 8	Physical Ed.	—
		17

THE CURRICULUM IN MINING ENGINEERING

Mining engineering has to do with the extraction of raw materials of economic value from the earth and their preparation for the needs of modern civilization. The mining engineer therefore operates coal deposits, mines which produce ores of the common and precious metals, quarries, oil and gas wells, etc. In so doing he makes use of the technical and business principles which he has acquired by study in every curriculum of the University. In view of the breadth of training and fields of possible activity, few professions offer more varied, interesting and profitable experiences than that of mining engineering.

The present curriculum offers several options in the junior and senior years. In one, the student may select the mining and dressing of ores, or the mining and preparation of fuels; in another he may specialize in construction materials, structural steel design, or electrometallurgy; in a third he may elect advanced geology, fuel technology, metallurgy, engineering laboratory, or mine administration; while in a fourth he may choose one of several business subjects, or Spanish.

During the freshman year a foundation is laid in the fundamental subjects of mathematics, physics, chemistry, drawing and English. Lectures are given in physiology and hygiene, and in military science and tactics. Military drill and systematic physical exercise are required.

Land, Topographic and Railroad Surveying is given in the summer session at the close of the freshman year; Mine Surveying, given in the junior year, includes actual surveying in the coal mines and inspection trips to mines and coal breakers.

The course in chemistry begins with an introduction to general chemical theory and the elements, supplemented by laboratory work. This is followed by Qualitative and Quantitative Analysis. Chemical problems and reactions are taught in Stoichiometry. Assaying, Coal, Gas and Oil Analysis is given in the summer session. The instruction includes the analysis of common ores, fuels, gases and metallurgical products.

Mineralogy is introduced by a short course in crystallography, in which models of crystals and mineral specimens are studied.

In the courses in geology, the student studies the nature and structure of the rock masses of the earth's crust and the forces which modify them. A brief review of historical geology gives an insight to the formation of the earth and the development of life as recorded by fossil remains. Practice in Field Geology teaches the methods by which rock formations are accurately mapped. Economic Geology treats of the origin, mode of occurrence and distribution of the metallic and non-metallic minerals and substances of commercial value in the earth. The course in Petrography teaches the student to identify the common rock-forming minerals by the use of the microscope. The course in Stratigraphic Geology discusses the geologic ages and the geographic distribution of the rocks of the continent and their history.

The course in Heat Engines includes a study of boilers, steam and gas engines, and steam turbines. Boiler and engine tests are given in the course in Engineering Laboratory, Mechanics of Materials teaches the theory of beams, columns, shafts and the methods of designing them for use in structures. Graphical analysis of the forces applied in the above is taught in the course in Graphic Statics. Hydraulics deals with the flow of liquids through orifices, pipes and channels, and with the principles of hydraulic motors. Practical tests in the Fritz Engineering Laboratory constitute an important part of the work of these courses.

The instruction in Mining Engineering and Mining Methods is given during the junior year, under the following subdivisions: prospecting, boring, mining or exploitation, haulage, hoisting, drainage, ventilation, lighting, first-aid and railroads. These subjects treat successively of the steps by which minerals are discovered and valued, the manner in which they are extracted from the earth and brought to the surface, the manner in which accidents may occur, means for guarding against them, the treatment of injured persons, and the means by which mines are maintained in an economical condition from the viewpoint of mine owner and miner.

The subjects of Ore Dressing and Coal Preparation, supplemented by work in the Coxe Mining Laboratory, deal with the processes by which ores and fuels are rendered marketable.

Fuel Technology deals with the theoretical aspects and practice in the utilization of coal, oil and gas.

Construction treats of materials used in roads and structures in and around mines, particluar attention being given to the use of reinforced concrete. In Structural Steel Design a study is made of the stresses acting on steel structures, special emphasis being given to the design of types common to mining plants. Mine Administration discusses the method of employing labor, mining principles and management.

The course in Oil Field Practice includes a study of the occurrence and distribution of petroleum and natural gas, the methods of prospecting, the means for obtaining them from the earth, and their storage, transportation, refining and marketing.

In Metallurgy the general principles of the subject, embracing fuel, furnaces and processes, are presented, followed by the metallurgy of iron and steel, copper, lead, gold, silver, zinc, tin, mercury, nickel and aluminium. Electrochemistry and Electrometallurgy make the student familiar with the practical applications of electricity to metallurgical processes including electric furnace practice. Visits of inspection are made to metallurgical plants in the vicinity, and also to those near New York City.

Dynamos and Motors and Alternating Currents extend over the entire senior year and embrace the study of the industrial applications of electricity which are of particular value to the mining engineer; practical work in the Dynamo Laboratory is included in these courses.

The courses in Business Administration in the junior and senior years present the economic, industrial, administrative and legal aspects of conditions in the business world which are of particular importance to the engineering professions.

The option in Spanish is offered during the senior year for those who purpose going to Latin-American countries.

Sanitary Bacteriology has to do with the study of bacteria, and their particular importance in connection with public water supplies, water analysis, sewage disposal, etc.

From the foregoing description of the general content of the curriculum, it will be noted that the student in Mining Engineering has studies in all of the technical departments of the University, as well as in the Colleges of Arts and Science and Business Administration.

The facilities for supplementing the work of the curriculum by inspection trips are exceptionally good. Cement mills, ore and coal mines, limestone, slate and cement quarries are within easy distance, and in the city are the great works of the Bethlehem Steel Company. During the senior year all students are required to make inspection trips to the anthracite coal regions and to the metal mining districts of eastern Pennsylvania and of New Jersey.

Voluntary inspection trips to the mines of the northeastern and central part of the United States and southern Canada, which included the Lake Superior iron and copper region and the nickel, gold and silver districts of Ontario, were made in the summers of 1922, 1924 and 1926. These trips proved so successful that it is expected a similar one will be offered every other year, provided a sufficient number of students apply. By traveling in automobiles and camping en route, it is possible to keep the expenses very low. The cost of this trip, lasting five weeks, is approximately $175.

The expenses of the inspection trips required of all mining students are approximately as follows:

Three Metallurgical one-day trips	$15
Mine Surveying and Inspection trip, one week	$30
Mining and Geological Inspection trips, four days	$25

The Department of Mining Engineering has exceptional facilities in the Eckley B. Coxe Mining Laboratory, a description of which is given under the heading of Buildings.

Graduates of this curriculum receive the degree of Bachelor of Science in Mining Engineering.

THE CURRICULUM IN MINING ENGINEERING

FRESHMAN YEAR

See page 53

SOPHOMORE YEAR

FIRST SEMESTER

Number	*Title*	*Cr.Hrs.*
Math. 4	Elem. Calculus	3
Phys. 4	Mech., Heat & Light	3
Phys. 5	Physics Lab.	1
Geol. 1	Mineralogy	4
Chem. 36	Quant. Anal.	2
Chem. 48	Quant. Anal. Conf.	1
M.E. 22	Heat Engines	3
Mil. 3	M. S. & T.	2
E.C. 3	Eng. Conferences	—
P.E. 3	Physical Ed.	—
Chap. 3	Chapel	—
Lect. 3	Lectures	—
		19

SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*
Math. 5	Appl. Calculus	3
Phys. 6	Elec., Mag. & Sound	3
Phys. 7	Physics Lab.	1
Geol. 4	Geology	2
Geol. 5	Petrology	1
Geol. 6	Geology Trips	1
Chem. 37	Quant. Anal.	2
Chem. 49	Quant. Anal. Conf.	1
M.E. 23	Heat Engines	3
Mil. 4	M. S. & T.	2
E.C. 4	Eng. Conferences	—
P.E. 4	Physical Ed.	—
Chap. 4	Chapel	—
Lect. 4	Lectures	—
		19

SUMMER SESSION: Chem. 39, Assaying, Coal, Gas and Oil Analysis, four weeks, 4.

JUNIOR YEAR

FIRST SEMESTER

Number	*Title*	*Cr.Hrs.*
Mine. 1	Mining Eng.	3
Mine. 2	Mining Methods	3
Geol. 12	Petrography	2
C.E. 9	Mech. of Materials	3
C.E. 10	Mat. Testing Lab.	1
Mine. 3	Ore Dr. & Lab.	3
Mine. 4	or Coal Prep.	
Bus. 3	Economics	3
P.E. 5	Physical Ed.	—
Lect. 5	Lectures	—
		18

SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*
Mine. 5	Mining Eng.	3
Mine. 6	Mine. Surv.	3
Met. 21	Metallurgy	2
Met. 81	Met. Problems	1
C.E. 13	Hydraulics	2
C.E. 14	Hydraulics Lab.	1
Eng. 9	Adv. Composition	3
Bus. 18	Accounting	3
Bus. 4	or Economics.	
Bus. 25	or Corp. Fin.	
P.E. 6	Physical Ed.	—
Lect. 6	Lectures	—
		18

SUMMER: Mine. 20, Industrial employment for eight weeks, with report; or Mil. 9 or 19, Reserve Officers' Training Corps Camp for those who elect Advanced Military Science and Tactics, 3.

SENIOR YEAR

FIRST SEMESTER

Number	*Title*	*Cr.Hrs.*
Mine. 7	Construction	2
Met. 25	or Electrochm.	
Geol. 7	Economic Geol.	2
C.E. 20	Graphic Statics	2
E.E. 50	Dyn. & Motors	2
E.E. 51	Dynamo Lab.	1
Geol. 11	Field Geology	2
Met. 3	or Non-ferrous Metal.	
Biol. 51	Sanitary Bac.	2
Mine. 10	or Fuel Tech.	
Geol. 15	Engine Lab.	1
M.E. 21	or Geol. Method	
Span. 1 or 11	Spanish	3
Bus. 39	or Ind. Man.	
Bus. 56	or Bus. Law.	
P.E. 7	Physical Ed.	—
		17

SECOND SEMESTER

Number	*Title*	*Cr.Hrs.*
Mine. 8	Oil Field Prac.	2
Geol. 8	Econ. Geol.	3
Geol. 10	Stratig. Geol.	2
Met. 4	or Non-ferrous Metal.	
Mine. 11	or Fuel Tech.	
E.E. 52	Alt. Currents	2
E.E. 53	Dynamo Lab.	1
C.E. 30	Str. Steel Des.	3
C.E. 25	or Reinf. Con.	
M.E. 25	Engine Lab.	1
Geol. 15	or Geol. Method	
Mine. 9	or Mine. Adm.	
C.E. 26	or Cem. Lab.	
Span. 2 or 12	Spanish	3
Bus. 18	or Accounting	
Bus. 25	or Corp. Fin.	
Bus. 30	or Mon. & Bank.	
P.E. 8	Physical Ed.	—
		17

DESCRIPTION OF COURSES

Following is a complete list of the undergraduate and graduate courses offered by the University. The number of exercises a week in each subject is indicated by the figures in parenthesis. Three hours of drawing, of work in the laboratory or of practice in the field are regarded as equivalent to a recitation or lecture of one hour's duration.

ASTRONOMY

See Mathematics and Astronomy

BIOLOGY

PROFESSOR HALL, ASSOCIATE PROFESSOR THOMAS, MR. MORHOUSE

Biol. 1. Biology. Lectures, written recitations, laboratory work. The lectures deal with the following topics: (*a*) fundamental conceptions; life, protoplasm, the cell, etc.; (*b*) the more important biological theories; variation, heredity, evolution, etc. In the laboratory, types of the various phyla are dissected and drawings made. Fee, $3. First semester (3).

Biol. 2. Mammalian Anatomy. Two laboratory periods, the work consisting of the detailed dissection of a mammal. Prerequisite: Biol. 1. Fee, $5. Second semester (2).

Biol. 3. Comparative Anatomy of Vertebrates. Text-book work and recitations on the comparative anatomy of vertebrates; laboratory work consisting of the dissection of types of the several vertebrate classes. Prerequisite: Biol. 1. Fee, $3. Second semester (3).

Biol. 4. Vertebrate Embryology. Lectures, text-book and laboratory work. Study of living, preserved and sectioned material demonstrating the successive stages of cleavage, gastrulation, and the formation of organs. Prerequisite: Biol. 1 and, preferably, Biol. 3. First semester (3).

Biol. 5. Physiology. A course in normal physiology, hygiene and sanitation aiming to give that knowledge of the body and its functions which all should have. Emphasis on the application of such knowledge to personal hygiene and public sanitation. First semester (2).

Biol. 6. BOTANY. A survey of the subject designed to give the student a general knowledge of plant life, morphology, physiology and the classification of the vegetable kingdom. Type species studied in the laboratory and field trips to familiarize the student with plant habitats. Second semester (3).

Biol. 7. ELEMENTARY BIOLOGY. A course dealing with the characteristics and the history of living organisms. First semester (3).

Biol. 8. ELEMENTARY BIOLOGY. Continuation of Biol. 7. Second semester (3).

Biol. 9. GENETICS. The laws and the mechanism of heredity. Eugenics. Prerequisite: Biol. 1. Second semester (1).

Biol. 15. FRESHMAN HYGIENE. A course of six lectures on personal and social hygiene, with the cooperation of the Director of the Student Health Service. This course is given during Freshman Week and must be passed by all freshmen.

Biol. 16. SOCIAL HYGIENE. A course for students who for any reason have not taken or have not passed Biol. 15. Second semester.

Biol. 50. SANITARY BACTERIOLOGY. Lectures, recitations and laboratory work. Study of bacteria and allied microorganisms by staining and cultural methods; their sanitary importance in public water supplies; the bacteriology of sewage and sewage treatment; qualitative and quantitative bacteriological and biological analysis of water and sewage. Fee, $3. Second semester (3).

Biol. 51. SANITARY BACTERIOLOGY. Similar to Biol. 50. Fee, $3. First or second semester (2).

Biol. 52. BACTERIOLOGY. An elementary course in general bacteriology. Lectures, recitations and laboratory work. A general study of the morphological and cultural characteristics of bacteria and allied microorganisms; special attention given to those forms of sanitary and economic importance; the role of bacteria, yeasts and molds in fermentation industries, in the soil, and in disease. Fee, $3. First semester (3).

Biol. 54. BACTERIOLOGY. Recitations, lectures and laboratory work. A course in elementary bacteriology for pre-medical students and others specializing in biological sciences. Laboratory work including special staining methods in the study of morphology; differential media in the study of bacterial physiology; and in general a more thorough study of the microorganisms themselves rather than their specific sanitary or industrial importance. Fee, $3. First semester (3).

For Advanced Undergraduates and Graduates

Biol. 53. ADVANCED BACTERIOLOGY. A laboratory and seminar course in advanced laboratory technic. A thorough cultural study of the more common pathogenic bacteria. Bacteriological laboratory diagnosis of pathological fluids. Prerequisites: Biol. 51, 52 or 54. Fee, $3. Second semester (3).

Biol. 58. IMMUNOLOGY. A comprehensive recitation and laboratory course. The history of subject of immunity and the modern theories concerning it. The laboratory work consists of immuniological diagnostic tests for syphilis, diphtheria, typhoid fever, etc. Prerequisite: Biol. 51, 52 or 54. Biol. 53 desirable either previously or simultaneously. Fee, $3. Second semester (3).

Biol. 12. HISTOLOGY AND MICROSCOPIC TECHNIQUE. Second semester (2).

For Graduates

Prerequisite for graduate work in Biology: the amount of biology usually obtained by an undergraduate majoring in that department. Prerequisite for graduate work in Bacteriology: a satisfactory course in undergraduate bacteriology and a sufficient preparation in organic chemistry.

Biol. 103. VERTEBRATE HISTOGENESIS AND ORGANOGENESIS. Careful following, in the laboratory, of the development of a vertebrate; tracing of the history of the germ-layers, organs and tissues; organogenesis dealing with the association of tissues to form organs. First semester (3). Professor Hall.

Biol. 105. HISTORY OF BIOLOGY. A course based on reading, seminars and written reports. First or second semester (2). Professor Hall.

Biol. 106. BIOLOGICAL THEORIES. A course dealing especially with genetics. First or second semester (2). Professor Hall.

Biol. 107. BIOLOGICAL RESEARCH. In this course a student may pursue investigations in such subjects as embryology, comparative anatomy, genetics, etc., according to his preparation and interests. First semester (3). Professor Hall.

Biol. 108. BIOLOGICAL RESEARCH. Continuation of Biol. 107. Second semester (3). Professor Hall.

Biol. 151. BACTERIOLOGICAL RESEARCH. Advanced cultural and microscopic study of specific strains of bacteria, preparation of antigens, immunization of animals and the study of immune products, such as agglutinins, precipitins, bacteriotropins, lysins, amboceptors, etc. Prerequisites: Biol. 51 (or 52 or 54) and 53 and at least one term of organic chemistry. First semester (3). Associate Professor Thomas.

Biol. 152. BACTERIOLOGICAL RESEARCH. Continuation of Biol. 151. Second semester (3). Associate Professor Thomas.

Biol. 153. BACTERIOLOGICAL RESEARCH, CONTINUED. An extensive study and abstraction of the literature with additional laboratory work on the immunological phases of the study. Prerequisites: Biol. 51 (or 52 or 54) and 53. Taken simultaneously with Biol. 151. First semester (2). Associate Professor Thomas.

Biol. 154. BACTERIOLOGICAL RESEARCH, CONTINUED. Continuation of Biol. 153 and taken simultaneously with Biol. 152. Second semester (2). Associate Professor Thomas.

Biol. 155. INDUSTRIAL BACTERIOLOGY. An advanced course in Bacteriology including aspects of industrial chemistry in which bacteria play an essential part in the process, as in the manufacture of acetone, butyl alcohol, acetic and lactic acids, etc. A study of the common contaminating organisms which cause commercial losses in the manufacture of sugar, leather, etc. Prerequisite: Biol. 52 or 54. First semester (3). Associate Professor Thomas.

Biol. 156. BIOLOGICAL PRODUCTS. A lecture and laboratory course in the practical manufacture of vaccines, serums, and other substances used in immune therapy and the theory underlying their use. Prerequisite: Biol. 52 or 54. Second semester (3). Associate Professor Thomas.

Biol. 157. ADVANCED PUBLIC SANITATION. A study of the biological, chemical, bacteriological and physical aspects of public water supplies. Prerequisites: Biol. 51, 52, or 54 and at least two years of Chemistry including quantitative analysis. First or second semester (1). Associate Professor Thomas.

Biol. 158. ADVANCED PUBLIC SANITATION. Similar to Biol. 157, dealing with systems of sewage disposal. Prerequisites: same as for Biol. 157. First or second semester (1). Associate Professor Thomas.

Biol. 159. ADVANCED PUBLIC SANITATION. Similar to Biol. 157, dealing with milk distribution. Prerequisites: same as for Biol. 157. First or second semester (1). Associate Professor Thomas.

BUSINESS ADMINISTRATION

PROFESSORS CAROTHERS, COWIN AND DIAMOND,
ASSOCIATE PROEESSOR WOODBRIDGE,
ASSISTANT PROFESSORS BRADFORD AND JONES,
MESSRS. TAGGART AND WITHERS

Bus. 1. INDUSTRIAL EVOLUTION. An introductory course outlining the gradual development of economic organization, with special attention to the stages of economic progress and the social institutions growing out of these stages. First semester (3).

Bus. 2. INDUSTRIAL EVOLUTION. Continuation of Bus. 1, with special emphasis on the Industrial Revolution, the economic history of the United States, and modern industrial enterprises in America. Second semester (3).

Bus. 3. ECONOMICS. A general course in the principles of economics, covering the fundamental forces governing the production, distribution and consumption of wealth, with emphasis on value, exchange, money, rent, interest, profits and wages. First semester (3).

Bus. 4. ECONOMICS. Continuation of Bus. 3. Second semester (3).

Bus. 5. ECONOMICS FOR ENGINEERS. An intensive course in the principles of economics, covering the fundamentals in one semester. Specially designed for engineering students. Both semesters (3).

Bus. 11. ACCOUNTING. A study of the elementary principles of accounting, with sufficient practical work to develop a knowledge of accounting practice; theories of debit and credit; construction of accounts; partnership and corporation accounts; financial statements. First semester (3).

Bus. 12. ACCOUNTING. Continuation of Bus. 11. Second semester (3).

Bus. 13. ADVANCED ACCOUNTING. Advanced work in the field of accounting, with emphasis on the problems of assets valuation, corporation accounts, liquidations and consolidations. Prerequisites: Bus. 11 and 12. First semester (3).

Bus. 14. ADVANCED ACCOUNTING. Continuation of Bus. 13. Second semester (3).

Bus. 18. ACCOUNTING FOR ENGINEERS. An intensive course in the principles and practice of accounting, covering the fundamentals in one semester. Specially designed for engineering students. Both semesters (3).

Bus. 21. CORPORATION FINANCE. An outline of the methods of corporations in obtaining capital, issuing securities, and extinguishing debts, with attention to the rights and obligations of security holders and to problems of corporation insolvency and dissolution. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 22. CORPORATION FINANCE. Continuation of Bus. 21. Second semester (3).

Bus. 25. CORPORATION FINANCE. An intensive course covering the fundamentals of corporation finance in one semester. Specially designed for engineering students. Both semesters (3).

Bus. 29. MONEY AND BANKING. A study of the nature of money and the principles of banking, with emphasis on coinage systems, monetary standards, paper currency, the economic functions of banks, banknote issue, various banking systems, and the Federal Reserve System. Prerequisites: Bus 3 and 4. First semester (3).

Bus. 30. MONEY AND BANKING. Continuation of Bus. 29. Second semester (3).

Bus. 33. LABOR. A one-semester course in the economics of labor, with special reference to wage systems, labor legislation, organized labor and methods used in the conflicts of labor and capital. First semester (3).

Bus. 38. TRANSPORTATION. A one-semester course in the economics of transportation, with special reference to railway service and rates, railway development, railway finance and railway regulation. Second semester (3).

Bus. 39. INDUSTRIAL MANAGEMENT. A course in the essential problems of organization, financial administration, plant layout, production control and employment policies of industrial enterprises. Prerequisites: Bus. 21 and 22. First semester (3).

Bus. 40. INDUSTRIAL MANAGEMENT. Continuation of Bus. 39. Second semester (3).

Bus. 45. STATISTICS. A study of the methods of statistical analysis and graphical representation. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 46. BUSINESS CYCLES AND FORECASTING. A course dealing with the nature of the business cycle and the application of statistics to business trends, with special attention to forecasting and business barometers. Prerequisite: Bus. 45. Second semester (3).

Bus. 49. ECONOMIC GEOGRAPHY. A survey of the geographic factors determining economic development, with special reference to the chief economic materials and to the geographic influences responsible for the economic history and the economic position of the United States. First semester (3).

Bus. 50. ECONOMIC GEOGRAPHY. Continuation of Bus. 49. Second semester (3).

Bus. 56. BUSINESS LAW. An intensive one-semester course in the essentials of business law. Second semester (3).

Bus. 57. MARKETING. A one-semester course dealing with the distribution of economic goods, with emphasis on the chief agencies of distribution, marketing practice, wholesale and retail, and the produce exchanges. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 75. Summer Reading in Economics. For students in Chemistry and Chemical Engineering. Following junior year (1).

For Advanced Undergraduates and Graduates

Bus. 7. Advanced Economics. An advanced course in the principles of economics, dealing especially with the theory of the distribution of wealth, the nature of the productive process, the history of economic doctrines, and proposed plans of economic reform such as socialism. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 8. Advanced Economics. Continuation of Bus. 7. Second semester (3).

Bus. 15. Cost Accounting. A study of the methods used by manufacturing and commercial enterprises in ascertaining, recording and controlling costs. Prerequisites: Bus. 11 and 12. First semester (3).

Bus. 16. Accounting Systems. A special study of various systems of accounts, with emphasis on cost accounting and production control. Second semester (3).

Bus. 23. Investments. A one-semester course which makes a detailed study, from the standpoint of the investor, of the various types of corporation and government securities, with special reference to owners' equities, comparative yields and the machinery of investment, including stock exchange operations. Prerequisites: Bus. 21 and 22. First semester (3).

Bus. 26. Public Finance. A one-semester course dealing with government expenditures and revenues, public debts and taxation, with emphasis on the economics and the administration of federal and state taxes. Prerequisites: Bus. 3 and 4. Second semester (3).

Bus. 61. Sociology. A study of the nature and the growth of social institutions, with emphasis on evolution, racial development, social stratification, and the social problems connected with the institutions of private property, family organization and sex. Prerequisites: Bus. 3 and 4. First semester (3).

Bus. 62. Sociology. Continuation of Bus. 61. Second semester (3).

CHEMISTRY AND CHEMICAL ENGINEERING

PROFESSORS ULLMANN AND BABASINIAN,
ASSOCIATE PROFESSORS DIEFENDERFER,* CHAMBERLIN AND LONG,
ASSISTANT PRPFESSORS BECK, EWING, ANDERSON,
NEVILLE AND THEIS,
MESSRS. SMULL, GRAY, HAZLEHURST, MC MILLEN, ROSE, BROWN,
WETTERAU AND WHITENIGHT

Chem. 1. ELEMENTARY CHEMISTRY. Elementary phenomena and principles of chemistry. Lectures illustrated by experiments, diagrams, working drawings and specimens from the museum. First semester (2).

Chem. 3. INTERMEDIATE CHEMISTRY. A course for students who pass the examination in Elementary Chemistry held during Freshman Week. Prerequisite: satisfactory preparation in the rudiments of chemistry. First semester (2).

Chem. 6. ADVANCED CHEMISTRY. Inorganic chemistry. Lecture course with recitations. Theories of chemistry; physical and chemical methods of determining atomic and molecular weights, thermo-chemistry, dissociation, solution, catalysis, electrolysis, radio-activity, non-metallic elements and their compounds. Prerequisites: Chem. 1 and 11 or 3 and 13, 8 and 20. First semester (3).

Chem. 7. ADVANCED CHEMISTRY. Inorganic chemistry. Continuation of Chem. 6. Lecture course with recitations. Electronics, atom structure and phase rule, solid solutions, metallic elements and their compounds and alloys. Readings in original literature. Prerequisites: Chem. 1 and 11 or 3 and 13, 8 and 20. Second semester (3).

Chem. 8. STOICHIOMETRY. Chemical problems and reactions. Second semester (1).

Chem. 11. CHEMISTRY LABORATORY. Experiments covering a systematic study of the chemical and physical properties of the more important elements and their compounds. Deposit, $15. First semester (2).

Chem. 12. CHEMISTRY LABORATORY. Primarily for Arts and Science and Business Administration students. Shorter than Chem. 11. Deposit, $15. First semester (1).

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* Absent on leave 1927-1928.

Chem. 13. Chemistry Laboratory. Experiments designed to accompany Chem. 3. Prerequisite: Satisfactory preparation in the rudiments of laboratory chemistry. Deposit, $15. First semester (2).

Chem. 14. Chemistry Laboratory. Primarily for Arts and Science and Business Administration students. Shorter than Chem. 13. Deposit, $15. First semester (1).

Chem. 20. Qualitative Analysis. The fundamental scientific principles and the practice of qualitative analysis methods, accompanied by lectures and demonstrations covering briefly the more important metallic elements and their industrially interesting compounds. Deposit, $25. Second semester (3).

Chem. 21. Qualitative Analysis. Similar to Chem. 20 but shorter. Deposit, $25. Second semester (2).

Chem. 30. Quantitative Analysis. Practical work in the quantitative laboratory, accompanied by lectures and recitations; an introduction to gravimetric analytic method and typical fundamental volumetric processes. Prerequisites: Chem. 1 and 11 or 3 and 13, 20 or 21. Deposit, $30. First semester (3).

Chem. 31. Quantitative Analysis. Continuation of Chem. 30. Analysis of metallic products, ores and alloys of industrial interest chosen to represent the application of quantitative chemical principles to analysis. Deposit, $30. Second semester (3).

Chem. 33. Quantitative Analysis. Practical work in the quantitative laboratory. Analysis of simple chemical compounds, ores and metallurgical products. Prerequisites: Chem. 1 and 11 or 3 and 13, 20 or 21. Deposit, $25. First semester (3).

Chem. 35. Quantitative Analysis. Continuation of Chem. 33. Deposit, $30. Second semester (3).

Chem. 36. Quantitative Analysis. Practical work in the quantitative laboratory. Analysis of simple chemical compounds. Prerequisites: Chem. 1 and 11 or 3 and 13, 20 or 21. Deposit, $25. First semester (2).

Chem. 37. Quantitative Analysis. Continuation of Chem. 36. Deposit, $30. Second semester (2).

Chem. 39. ASSAYING, COAL, GAS AND OIL ANALYSIS. Lectures and laboratory practice in the furnace assay of the ores of lead, gold and silver, and of gold and silver bullion; cyanidization; calculations for slags and slag mixtures; laboratory practice and class-room discussion of the analysis of boiler water, mine water, coal, coke, tar, gas, petroleum and petroleum products; calorimetry. Prerequisites: Chem. 8, 30, 33 or 36. Deposit, $30. Summer session: a lecture and seven hours of laboratory work each week-day for four weeks, beginning June 4, 1928. Tuition fee, $40. (4).

Chem. 41. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations concerning the scientific foundations and laboratory practice of Chem. 30. Prerequisites: Chem. 1 and 11 or 3 and 13, 20 or 21. First semester (1).

Chem. 44. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations pertaining to the laboratory work of Chem. 33. Prerequisites: Chem. 1 and 11 or 3 and 13, 20 or 21. First semester (1).

Chem. 45. QUANTITATIVE ANALYSIS CONFERENCE. Continuation of Chem. 41. Lectures and recitations to accompany Chem. 31. Second semester (1).

Chem. 46. QUANTITATIVE ANALYSIS CONFERENCE. Continuation of Chem. 44. Lectures and recitations to accompany Chem. 35. Second semester (1).

Chem. 48. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations to accompany Chem. 36. First semester (1).

Chem. 49. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations to accompany Chem. 37. Second semester (1).

Chem. 50. SUMMER WORK. During the summer following the junior year students in the Curriculum in Chemistry are required to gather industrial experience by at least eight weeks' work in industrial shops or laboratories.

Chem. 78. CHEMICAL ENGINEERING. An introduction to chemical engineering reviewing a number of industrial processes mainly in their engineering aspects; hydrostatics and pneumatics. Prerequisites: Chem. 6, 30, 41. First semester (3).

Chem. 99. RESEARCH CHEMISTRY LABORATORY. Advanced stage of study or an investigation approved by the Professor of

Chemistry of some novel problem, involving exhaustive laboratory and library study. Deposit, $15. Second semester (2).

Deposits to cover breakage, chemicals, etc., are required as indicated above. The unused portion of the deposit is returned to the student.

For Advanced Undergraduates and Graduates

Chem. 38. INDUSTRIAL ORGANIC ANALYSIS. A laboratory study of special operations in quantitative analytical chemistry as applied to organic compounds of industrial importance; the chemical analysis of drinking water and of milk are included in this course. Prerequisites: Chem. 31 or 35 and 60. Deposit, $35. Second semester (3).

Chem. 47. INDUSTRIAL ANALYSIS CONFERENCE. Conferences on the principles and the applications of the laboratory methods of industrial organic analysis of Chem. 38. Prerequisites: Chem. 45 and 60. Second semester (1).

Chem. 60. ORGANIC CHEMISTRY. Lectures and recitations. A systematic survey of the typical compounds of carbon; their classification and general relations; study of synthetic reactions. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21; 30 or 33. First semester (4).

Chem. 61. ORGANIC CHEMISTRY. Continuation of Chem. 60. Second semester (3).

Chem. 62. ADVANCED ORGANIC CHEMISTRY. An advanced course in certain theories of organic chemistry. Prerequisites: Chem. 60, 65, 61, 66 with high grades. First semester (2).

Chem. 63. CHEMISTRY OF DRUGS, DYES AND RELATED COMPOUNDS. Prerequisites: Chem. 60, 65, 61, 66 with high grades. Given in alternate years. First semester (2).

Chem. 65. ORGANIC CHEMISTRY LABORATORY. Determinations of specific gravities, melting points, boiling points, vapor densities; qualitative and quantitative determinations of carbon, hydrogen, nitrogen and the halogens; preparation of pure organic compounds. Prerequisites: Chem. 1 and 11, or 3 and 13; 20 or 21; 30 or 33. Deposit, $30. First semester (2).

Chem. 66. ORGANIC CHEMISTRY LABORATORY. Continuation of Chem. 65. Practical methods of saturation, nitration, reduction, diazotization, sulphonation, etc.; preparation of pure compounds; study of the properties of dyes and other commercial products. Deposit, $40. Second semester (3).

Chem. 67. ORGANIC CHEMISTRY LABORATORY. Similar to Chem. 66 but shorter. Deposit, $40. Second semester (2).

Chem. 79. HISTORY OF CHEMISTRY. Chronological development of the science, with assigned reading. Prerequisites: Chem. 7 and 61. Second semester (1).

Chem. 80. CHEMICAL ENGINEERING LABORATORY. Engineering fundamentals, including machinery and materials of chemical plants; transportation in plant of gases, liquids and solids, grinding, pulverizing, screening, centrifuging, fuel technology and combustion engineering; lay-out and cost data of a simple manufacturing plant; laboratory work including study of some of these fundamentals. Visits to industrial plants for inspection of large units are an integral part of the course. Prerequisites: Chem. 31, 45, 60 and 65. Deposit, $25. First semester (3).

Chem. 81. CHEMICAL ENGINEERING. Continuation of Chem. 80. Discussion of unit engineering procedure. Processes considered: filtration, sedimentation, electric and magnetic separation, solution, stirring, mixing, crystallization, drying, evaporation, distillation. Assigned reading in industrial chemistry and visits to industrial plants incidental to the course. Second semester (3).

Chem. 85. CHEMICAL ENGINEERING PRACTICE. Comprehensive studies in nearby manufacturing plants of a few processes involving one or more unit engineering operations, these studies usually occupying time covering whole days or multiples thereof. Deposit, $10. Second semester (1).

Chem. 90. PHYSICAL CHEMISTRY. Lectures and recitations. Prerequisites: Math. 5, Chem. 7, 31 or 35. First semester (3).

Chem. 91. PHYSICAL CHEMISTRY. Continuation of Chem. 90. Second semester (2).

Chem. 92. ELECTROCHEMISTRY. Chemical reactions in gases, solutions, and molten electrolytes caused by the electric current. Quantitative relations between electromotive force, electrical energy and chemical energy. Efficiency and applicability of typical processes. Prerequisites: Math. 5, Chem. 7, and 31 or 35. First semester (1).

Chem. 95. PHYSICAL CHEMISTRY LABORATORY. Physio-chemical measurements. Prerequisites: Math. 5, Chem. 7, 31 or 35. Deposit, $10. First semester (1).

Chem. 96. PHYSICAL CHEMISTRY LABORATORY. Continuation of Chem. 95. Deposit, $10. Second semester (1).

Chem. 97. ELECTROCHEMISTRY LABORATORY. Experimental study of electrochemical reactions. Current efficiencies, electromotive force measurements and overvoltage; transport numbers; electrochemical preparations. Prerequisites: Math. 5, Chem. 7, and 31 or 35. Deposit, $5. First semester (1).

For Graduates

The prerequisites for graduate work in Chemistry as a major study are: Inorganic Chemistry (8), Qualitative Analysis (4), Quantitative Analysis (8), Organic Chemistry (10), Physical Chemistry (5), Physics (12), and Mathematics, including Calculus, (12).

Students of exceptional ability may be able to make up minor deficiencies while carrying graduate work. If the deficiencies are serious, a student can hardly expect to complete the requirements for the Master's degree within the minimum time.

Chem. 100. INORGANIC CHEMISTRY RESEARCH. Investigation in the field of inorganic chemistry and in drying oils and their metallic salts. Prerequisites as in the statement above introductory to graduate courses. Deposit, $30. First semester (4). Associate Professor Long, Assistant Professor Neville.

Chem. 101. INORGANIC CHEMISTRY RESEARCH. Continuation of Chem. 100. Deposit, $30. Second semester (4). Associate Professor Long, Assistant Professor Neville.

Chem. 102. ADVANCED INORGANIC CHEMISTRY. A course of conference and reading in the generalizations of inorganic chemistry. Prerequisites as in the statement above introductory to graduate courses and a reading knowledge of German and French. First semester (2). Associate Professor Long.

Chem. 103. ADVANCED INORGANIC CHEMISTRY. Continuation of Chem. 102. Second semester (2). Associate Professor Long.

Chem. 130. QUANTITATIVE ANALYSIS. Investigation of problems in analytic procedures. Prerequisites as in the statement above introductory to graduate courses. Deposit, $30. First semester (4). Professor Ullmann, Associate Professor Diefenderfer.

Chem. 131. QUANTITATIVE ANALYSIS. Continuation of Chem. 130. Deposit, $30. Second semester (4). Professor Ullmann, Associate Professor Diefenderfer.

Chem. 160. ORGANIC CHEMISTRY RESEARCH. Investigation of a problem in organic chemistry with particular reference to the dye-industry. Prerequisite: a course substantially equivalent to Chem. 61 and 65. Deposit, $30. First semester (4). Professor Babasinian.

Chem. 161. ORGANIC CHEMISTRY RESEARCH. Continuation of Chem. 160. Deposit, $30. Second semester (4). Professor Babasinian.

Chem. 165. ADVANCED ORGANIC PREPARATIONS. Mainly a laboratory course. Prerequisite: Chem. 65. Deposit, $30. First semester (2). Professor Babasinian.

Chem. 166. ADVANCED ORGANIC PREPARATIONS. Continuation of Chem. 165. Deposit, $30. Second semester (2). Professor Babasinian.

Chem. 180. INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING. Investigation of a problem in chemical engineering or in industrial chemistry. Prerequisites: for problems in industrial chemistry as in the statement above introductory to graduate courses; for investigation of a problem in chemical engineering, an undergraduate curriculum in chemical engineering substantially equivalent to the curriculum in this University. Deposit, $30. First semester (4). Professor Ullmann, Associate Professor Chamberlin, Assistant Professor Theis.

Chem. 181. INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING. Continuation of Chem. 180. Deposit, $30. Second semester (4). Professor Ullmann, Associate Professor Chamberlin, Assistant Professor Theis.

Chem. 184. TANNING TECHNOLOGY. Special development of inorganic, organic and physical chemistry and allied sciences as applied to control and research in tanning and in the manufacture of leather. Principles of design and operation of apparatus and machinery of the leather industry. Prerequisites as in statement above introductory to graduate courses. First semester (3). Assistant Professor Theis.

Chem. 185. TANNING TECHNOLOGY. Continuation of Chem. 184. Second semester (3). Assistant Professor Theis.

Chem. 186. TANNING ENGINEERING PRACTICE. A laboratory course to accompany Chem. 184. Experimental scientific studies in a small tannery of modern design of the major tanning and leather finishing processes. Visits to and studies in industrial tanneries. First semester (3). Assistant Professor Theis.

Chem. 187. TANNING ENGINEERING PRACTICE. Continuation of Chem. 186. Second semester (3). Assistant Professor Theis.

Chem. 190. PHYSICAL CHEMISTRY RESEARCH. Investigation of a problem in physical chemistry; vapor pressure studies in the constitution of inorganic salts. Prerequisites: the equivalent of Chem. 90, 91, 95 and 96. Deposit, $30. First semester (4). Assistant Professor Ewing.

Chem. 191. PHYSICAL CHEMISTRY RESEARCH. Continuation of Chem. 190. Deposit, $30. Second semester (4). Assistant Professor Ewing.

Chem. 192. THEORETICAL CHEMISTRY: KINETICS. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 90, 91, 95, and 96. Given in alternate years. Not given in 1928-1929. First semester (3). Dr. Hazlehurst.

Chem. 193. THEORETICAL CHEMISTRY: KINETICS. Continuation of Chem. 192. Second semester (3). Dr. Hazlehurst.

Chem. 194. THEORETICAL CHEMISTRY: THERMODYNAMICS. Prerequisites: a good working knowledge of mathematics and the equivalent of Chem. 90, 91, 95 and 96. Given in alternate years. First semester (3). Dr. Hazlehurst.

Chem. 195. THEORETICAL CHEMISTRY: THERMODYNAMICS. Continuation of Chem. 194. Second semester (3). Dr. Hazlehurst.

Chem. 196. COLLOIDS. Theories and applications of colloidal behaviour. Lectures and seminar with occasional demonstrations. Prerequisites as in statement introductory to graduate courses. First semester (3). Assistant Professor Neville.

Chem. 197. Catalysis. Theories of catalytic mechanism. Preparation, activation and control of catalysts. The applications of catalysis in various types of chemical reactions and in certain industrial processes. Lectures, seminar, demonstrations. Prerequisites as in statement above introductory to graduate courses. Second semester (3). Assistant Professor Neville.

Chem. 198. Advanced Physical Chemistry. A course arranged to go forward from courses in Elementary Physical Chemistry. Collateral reading required. Prerequisites as in the statement above introductory to graduate courses. Second semester (3). Assistant Professor Ewing.

Chem. 199. Physical Chemistry Methods. Advanced course in methods of physical chemistry laboratory practice. Prerequisites: the equivalent of Chem. 95 and 96. Deposit, $30. First semester (2). Assistant Professor Ewing.

CIVIL ENGINEERING

PROFESSORS FOGG AND WILSON,
ASSOCIATE PROFESSORS BECKER AND FULLER,
ASSISTANT PROFESSORS PAYROW AND UHLER,
MESSRS. JENSEN, MORRIS AND GETCHELL

C.E. 1. Engineering Drawing. The use of drawing instruments; lettering and tracing; mechanical drawing of objects; simple projections; isometric drawing. First semester (2).

C.E. 2. Engineering Drawing. The descriptive geometry of projections, intersections and developments; plans, elevations and sections of simple structural details. Prerequisite: C.E. 1. Second semester (2).

C.E. 6. Land and Topographic Surveying. The theory and practice of land surveying, including computation of areas, dividing land, determining heights and distances; map drawing and topographic signs; field work with level and transit; map drawing from students' field notes; theory and use of stadia; detailed field work in rough country; pen topography and contour maps. Prerequisites: plane trigonometry and engineering drawing. Summer session: a recitation and seven hours of field work each week-day for four weeks, beginning June 4, 1928. Tuition fee, $40. (4).

C.E. 7. Railroad Surveying. Reconnaissance, preliminary and location methods, with the theory of curves. Prerequisite: C.E. 6. Summer session: a recitation and seven hours of field work each week-day for two weeks, immediately following C.E. 6. Tuition fee, $20. (2).

C.E. 8. Mechanics of Materials. The elasticity and strength of timber, brick, stone and metals; theory of beams, columns and shafts, with the solution of many practical problems. Prerequisites: Phys. 1, 2 and 6, and Math. 5. First semester (4).

C.E. 9. Mechanics of Materials. An abridgement of C.E. 8. Prerequisites: Phys. 1, 2 and 6, and Math. 5. First semester (3).

C.E. 10. Materials Testing Laboratory. Fourteen experiments made by each student on wood, iron and steel to determine the action of materials under stress and to study the physical properties of materials of construction. The Fritz Engineering Laboratory, where this work is done, is equipped with 20,000, 50,000, 300,000, and 800,000-pound machines for tension, compression, and flexure, a 50,000-inch-pound machine for torsion, and other apparatus for special work. Concurrent with C.E. 8 or 9. Fee, $5. First semester (1).

C.E. 11. Railroads. Theory of curves and turnouts; preparation of profiles and maps; the computation of earth work and estimates of cost; the construction of road-bed, including ballast, cross ties, rails, switches, culverts and other details. Prerequisite: C.E. 7. First semester (3).

C.E. 12. Hydraulics. Hydrostatics and theoretical hydraulics; the flow of water through orifices, weirs, tubes, pipes and channels; naval hydromechanics; hydraulic motors; the solution of many practical problems. Prerequisites: Phys. 1, 2 and 6, and Math. 4. Second semester (3).

C.E. 13. Hydraulics. An abridgment of C.E. 12. Prerequisites: Phys. 1, 2 and 6, and Math. 4. First or second semester (2).

C.E. 14. Hydraulic Laboratory. Fourteen experiments made by each student in the hydraulic section of the Fritz Engineering Laboratory, which is equipped with pumps, weirs, turbines, water-wheels, meters and other apparatus for special work. Concurrent with C.E. 12 or 13. Fee, $5. First or second semester (1).

C.E. 15. STRESSES IN FRAMED STRUCTURES. Analytical and graphical determination of stresses in roof and bridge trusses under dead, live and wind loads; locomotive wheel loads on plate girders and bridge trusses. Prerequisite: C.E. 8 or 9. Second semester (4).

C.E. 16. HIGHWAY ENGINEERING. The location, construction and maintenance of roads and pavements; highway design. Prerequisite: C.E. 6; highly desirable, C.E. 7. Second semester (3).

C.E. 20. GRAPHIC STATICS. Analysis of the stresses in roof trusses and miscellaneous structures by the force polygon; applications of the equilibrium polygon to the discussion of beams and girders. Prerequisites: Phys. 1 and 2. First semester (2).

C.E. 25a. FOUNDATIONS. Construction and design. Concurrent with C.E. 25. Second semester (2).

C.E. 27. CONTRACTS AND SPECIFICATIONS. Lectures on the essentials of contracts and specifications for engineering structures. Prerequisite: junior standing. First semester (3).

C.E. 29. SUMMER WORK IN CIVIL ENGINEERING. During the summer following the junior year, students are required to spend at least eight weeks in shop work or on engineering construction, and are required to submit a written report on same.

C.E. 30. STRUCTURAL STEEL DESIGN. A special course for seniors in Mining Engineering, with special attention given to the design of mine structures. Prerequisites: C.E. 9 and 20. Second semester (3).

C.E. 50. THESIS. First or second semester.

For Advanced Undergraduates and Graduates

C.E. 18. STRUCTURAL STEEL DESIGN. Lectures and recitations. Theory of structural steel design and complete calculations for a through plate girder railroad bridge and for a highway truss bridge; design of mill buildings and miscellaneous structures. Prerequisite: C.E. 15. First semester (4).

C.E. 19. BRIDGE AND BUILDING CONSTRUCTION. Design and working drawings for structures, including a plate girder railway bridge, a highway truss bridge and a mill building. Concurrent with C.E. 18. First semester (2).

C.E. 21. HYDRAULIC AND WATER POWER ENGINEERING. Three recitations and one drawing-room exercise a week devoted to systems of water supply, including purification of systems, reservoirs, pipe lines, pumping plants; the design of a water supply distribution system; the measurement of flow in open channels by means of tubes and meters; water power; irrigation. Prerequisite: C.E. 12 or 13. First semester (4).

C.E. 22. GEODESY. Recitations, calculations, field work. Precise leveling; adjustment of instruments and investigation of their systematic errors; elements of least squares and their application to the adjustment of triangulations; field work in triangulation, in determination of azimuth, and with the plane table. Prerequisite: C.E. 6. Second semester (3).

C.E. 23. RAILROADS AND TERMINALS. Maintenance of way and the elements of railroad operation. Lectures on the economics of railroad location; the arrangement of yards, stations and terminals; train resistance; the application of electricity to the operation of railroads. Prerequisite: C.E. 11. Second semester (3).

C.E. 24. HIGHER STRUCTURES. Theory of continuous, draw, cantilever and suspension bridges; also metallic arches; theory and design of masonry walls, dams and arches; theory of deflections and applications to statically indeterminate structures. Prerequisite: C.E. 15. Second semester (3).

C.E. 25. REINFORCED CONCRETE DESIGN. Theory of reinforced concrete; design of reinforced concrete buildings, arches and miscellaneous structures. Prerequisite: C.E. 8 or 9; highly desirable: C.E. 15 and 18. Second semester (3).

C.E. 26. CEMENT AND CONCRETE LABORATORY. The manufacture, properties and testing of cement, mortar and concrete. All the standard tests made by each student on cement and on reinforced concrete beams and columns in the Fritz Engineering Laboratory. Concurrent with C.E. 25. Fee, $5. Second semester (1).

C.E. 28. SANITARY ENGINEERING. Systems of sewerage and methods of sewage treatment and disposal; the design of a sewerage system; house drainage. Prerequisite: C.E. 12 or 13. First semester (3).

C.E. 31. Advanced Sanitary Engineering. Continuation of C.E. 28. Second semester (3).

C.E. 32. Advanced Highway Engineering. Continuation of C.E. 16. Second semester (3).

For Graduates

The following courses are open to engineering graduates only. The prerequisite for any course listed is the undergraduate course of similar title.

C.E. 101. Bridge Design. The theory of arched structures, with the preparation of general plans and estimates and the economic comparison of different types. First semester (4). Professor Fogg.

C.E. 102. Bridge Design. Continuation of C.E. 101. Second semester (4). Professor Fogg.

C.E. 103. Testing of Materials. The properties of materials of construction, with special reference to inspection and testing. Original researches by the student in the laboratory. First semester (5). Professor Fogg, Associate Professor Fuller.

C.E. 104. Testing of Materials. Continuation of C.E. 103. Second semester (5). Professor Fogg, Associate Professor Fuller.

C.E. 105. Railroad Engineering. The economic location of railroads, as influenced by probable volume of traffic and cost of construction and operation; a study of the virtual profile in reducing gradients, with discussion of special cases. First semester (2). Professor Wilson.

C.E. 106. Railroad Engineering. Continuation of C.E. 105. Second semester (2). Professor Wilson.

C.E. 107. Sanitary and Hydraulic Engineering. The designing of reservoirs, tanks and pipe lines for water supply systems, and of sewers and other appurtenances for sewerage systems. Inspection of existing plants, with reports thereon. First semester (4). Assistant Professor Payrow.

C.E. 108. Sanitary and Hydraulic Engineering. Continuation of C.E. 107. Second semester (4). Assistant Professor Payrow.

ECONOMICS

See Business Administration

EDUCATION

See Philosophy, Psychology and Education

ELECTRICAL ENGINEERING

PROFESSOR ESTY,
ASSOCIATE PROFESSORS SEYFERT* AND BEAVER,
ASSISTANT PROFESSORS GRUBER, MILLER AND HIBSHMAN,
MESSRS. ANDERSON, ANDRESS AND MAYLOTT

E.E. 1. Electrical Distribution. Systems of direct current distribution; wiring formulas and applications; installation of electrical machinery and apparatus; interior wiring; overhead and underground constructon; rules and regulations of the National Board of Fire Underwriters. First semester (1).

E.E. 2. Direct Current Machinery. Review of principles of electricity and magnetism with special reference to their application to the dynamo. The construction, operation, and control of direct current machinery; practical operation and management of dynamo machines; station equipment; cost of electrical energy; electro-magnets, magnetism of iron; characteristic curves; armature windings. Illustrative problems. Prerequisites: Phys. 4 and 5. Second semester (3).

E.E. 3. Dynamo Laboratory, Elementary. Introductory course supplementing the class work of E.E. 2. Experimental studies and tests of direct current generators, motors, and appliances, for characteristics, regulation, efficiency, insulation, etc. Prerequisites: Phys. 4 and 5. Fee, $6. Second semester (1).

E.E. 4. Alternating Currents, Elementary. The elementary principles of alternating currents. Lectures, recitations and problem work. Prerequisites: Math. 4, Phys. 7, and E.E. 2. First semester (3).

E.E. 5. Dynamo Laboratory, Intermediate, Direct Current. Continuation of E.E. 3. Advanced testing of direct current machines. Prerequisites: E.E. 2 and 3. Fee, $6. First semester (1).

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* Absent on leave 1927-1928.

E.E. 6. Alternating Currents, Advanced. Continuation of E.E. 4. Advanced theoretical studies of alternators, synchronous motors and synchronous converters. Prerequisite: E.E. 4. Second semester (3).

E.E. 8. Dynamo Laboratory, Intermediate. Alternating Current. Continuation of E.E. 5. Advanced testing of direct current machines; alternating current testing begun. Prerequisites: E.E. 4 and 5. Fee, $6. Second semester (1).

E.E. 9. Dynamo Testing, Direct Current. Lectures on the methods of testing electrical machinery and apparatus, including direct current generators, motors and motor generator sets; special methods of testing large machines; experimental and commercial tests as carried out by the large manufacturing companies. Prerequisites: E.E. 4 and 5. Second semester (1).

E.E. 10. Dynamo Testing, Alternating Current. Lectures on testing of alternating current machinery and apparatus, including generators, motors, rotary converters, transformers, induction regulators, etc. Prerequisites: E.E. 6, 8 and 9. First semester (1).

E.E. 11. Dynamo Laboratory, Advanced. Advanced experimental studies and tests of direct and alternating current generators and motors, synchronous converters, transformers, and auxiliary apparatus; measurement of power in polyphase circuits. Prerequisites: E.E. 6, 8 and 9. Fee, $12. First semester (3).

E.E. 15. Electrical Engineering Seminar. A weekly meeting held in the department reading room for discussion of topics from the current journals of theoretical and applied electricity. Presentation of papers on assigned topics; new inventions and discoveries critically reviewed. Prerequisite: E.E. 4. First semester (1).

E.E. 16. Electrical Engineering Seminar. Continuation of E.E. 15. Presentation and discussion of reports on thesis work. Prerequisite: E.E. 15. Second semester (2).

E.E. 19. Dynamo Laboratory, Advanced. Continuation of E.E. 11. Advanced alternating current testing. Prerequisites: E.E. 10, 11 and 12. Fee, $12. Second semester (2).

E.E. 20. ELECTRIC TRACTION. The construction, equipment and operation of different types of electric railways. The application of electric traction under steam railroad conditions; the dynamics of electric train movements; predeterminations of speed-time curves and the power required for different types of runs; choice of car equipment; cost of construction and of operation; testing of railway systems; visits of inspection to power plants and required reports. Prerequisites: E.E. 12 and 14. Second semester (3).

E.E. 21. ELECTRICAL COMMUNICATION, I. A survey of the methods of electrical communication, principles of various systems of wire telegraphy, wire telephony, radio telegraphy and telephony, and laboratory measurements on radio and other communication circuits. Prerequisite: E.E. 4 or 52. Fee, $6. First semester (3).

E.E. 23. THESIS FOR DEGREE OF B.S. IN ELECTRICAL ENGINEERING. Each candidate for this degree may elect to present a thesis upon a subject chosen by the candidate during the first semester of the senior year. The work upon which the thesis is based may be done during either the first or second semester of the senior year and consists in part of reading from references furnished by the professor in charge, and in part of independent work in theory, experimental research or designing. Reports of progress on thesis work required from time to time during the semester. Much importance is attached to the thesis as evidence of the candidate's ability to carry out an independent investigation. First or second semester (3).

E.E. 24. SUMMER WORK. During the vacation following the junior year each student in Electrical Engineering is required to spend at least eight weeks in getting practical experience in some approved shop or plant. A written report on the shop or plant, and the experience gained therein, is due December 3. These reports should contain such calculations, photographs, drawings and plots as each individual case may require.

E.E. 26. ELECTRICAL COMMUNICATION, II. The principles of telephone and telegraph communication. Class work includes a physical and mathematical analysis of the fundamental telephone and telegraph circuits and constants, the propagation of electric waves along wires and cables, transmission problems and practice and carrier current communication. Laboratory work consists of experimental checks upon the theory developed in the class room. Prerequisite: E.E. 4 or 54. Fee, $6. Second semester (3).

E.E. 50. DYNAMOS AND MOTORS, GENERAL. An abbreviated course adapted to those students who do not continue this subject in the following year; the principles and practice of direct current engineering, including: the elementary theory, construction, operation and control of direct current generators and motors, electromagnets, solenoids, automatic starters and controllers, station equipment, storage batteries; illustrative problems. Prerequisites: Phys. 4 and 5. First or second semester (2).

E.E. 51. DYNAMO LABORATORY, BEGINNING. Introductory course supplementing the class work of E.E. 50. Experimental studies and tests of direct current generators and motors for characteristics, regulation, efficiency, etc. Prerequisites: Phys. 4 and 7. Fee, $6. First or second semester (1).

E.E. 52. ALTERNATING CURRENTS, GENERAL. A course following E.E. 50; the principles and practice of alternating current engineering; the theory of alternating currents with applications to alternating current generators, motors, transformers and other apparatus; systems of transmission and distribution; electric lighting. Prerequisite: E.E. 50. First or second semester (2).

E.E. 53. DYNAMO LABORATORY, INTERMEDIATE. Continuation of E.E. 51, supplementing the class work of E.E. 52 or 54. Advanced testing of direct current machines; practice in operating and testing alternating current apparatus. Prerequisites: E.E. 50 and 51. Fee, $6. First or second semester (1).

E.E. 54. ELECTRICAL ENGINEERING, APPLICATIONS. A course particularly adapted to students who do not specialize further along electrical lines; systems of generation, transmission, distribution and utilization taken up in order; under utilization special attention given to the application of electric motors to various industries; estimates and costs; problems. Prerequisites: E.E. 50, 51 and 52. Second semester (2).

E.E. 55. DYNAMO LABORATORY, ADVANCED. Continuation of E.E. 53, consisting of advanced direct and alternating current studies and tests. Primarily for non-electrical students taking more than the usual two semesters of dynamo laboratory. Prerequisites: E.E. 52 and 53. Fee, $6. Second semester (1).

For Advanced Undergraduates and Graduates

E.E. 12. ALTERNATING CURRENT MACHINERY. Study of the structural details, characteristics and operation of alternators, alternating current motors, rotary converters and transformers; application of vectors. Prerequisite: E.E. 6. First semester (3).

E.E. 13. ELECTRICAL DESIGN, DIRECT CURRENT. Application of electric, magnetic and mechanical principles to the design of electromagnetic mechanisms, direct current generators and motors; predetermination of characteristics and performance; armature winding. Lectures, recitations, problems, drafting. Prerequisites: E.E. 6 and 8. First semester (3).

E.E. 14. ELECTRIC STATIONS. Consideration of prime movers; generating machinery, discussion of types and operation; auxiliary machinery and transformers; storage batteries and their application; switch-boards, measuring and protective devices; design and arrangement; station characteristics; substations; operation and management; visits to neighboring plants. Prerequisites: C.E. 13, M.E. 23 and E.E. 6 or 52. First semester (2).

E.E. 17. ELECTRIC DESIGN, ALTERNATING CURRENT. Continuation of E.E. 13. Application of electric, magnetic and mechanical principles to the design of alternating current machinery and apparatus; predetermination of characteristics and performance; armature windings. Lectures, recitations, problems and drafting. Prerequisites: E.E. 11, 12 and 13. Second semester (3).

E.E. 18. ELECTRIC POWER TRANSMISSION. The long distance transmission of power by electricity for use in lighting, traction, mining and manufacturing work; mathematical determination of line constants, regulation, interference, transients, etc.; switching and protection of circuits; metering and methods of charging for power; recent practice in design and construction of lines and systems. Prerequisites: E.E. 12 and 14. Second semester (3).

E.E. 22. ELECTRIC TRANSIENTS. A recitation, lecture and laboratory course in elementary electric transients, designed to give a physical and quantitative idea of the more common transients occurring in electrical circuits, apparatus, and transmission lines; oscillograms of transients obtained in the laboratory to substantiate the theory of the classroom. Prerequisites: Math. 6, E.E. 10, 11 and 12. Fee, $6. Second semester (3).

For Graduates

For graduate students intending to take their major subjects in Electrical Engineering a preparation equivalent to the work required for the B.S. in E.E. degree is necessary.

E.E. 101. THEORY OF ALTERNATING CURRENTS AND ALTERNATING CURRENT MACHINERY. A course based upon the work of Arnold, Bedell and Crehore, Fleming, Steinmetz and Lawrence. First semester (4). Professor Esty.

E.E. 102. THEORY OF ALTERNATING CURRENTS AND ALTERNATING CURRENT MACHINERY. Continuation of E.E. 101. Second semester (4). Professor Esty.

E.E. 103. ELECTRICAL DESIGN. A course consisting of predeterminations by calculation of the characteristics, regulation and performance of electrical machinery. Analysis and use of designing constants. Design of special machines. First semester (3). Professor Esty.

E.E. 104. ELECTRICAL DESIGN. Continuation of E.E. 103. Second semester (3). Professor Esty.

E.E. 105. ELECTRIC TRACTION. The development of an electric railway project. Design of station and distribution system; operating characteristics of direct and alternating current railway motors; predetermination of motor equipment and run curves for given schedules and traffic; choice of system; estimates of cost. First semester (3). Professor Esty.

E.E. 106. ELECTRIC TRACTION. Continuation of E.E. 105. Second semester (3). Professor Esty.

E.E. 107. ELECTRICAL TESTING. Special experimental research in electrical engineering; tests of magnetic properties of iron and steel; investigation of the series single-phase alternating current motor; leakage reactance of induction motors; regulation of alternators; polyphase testing; electric railway testing. Fee, $12. First semester (3). Associate Professor Seyfert.

E.E. 108. ELECTRICAL TESTING. Continuation of E.E. 107. Fee, $12. Second semester (3). Associate Professor Seyfert.

E.E. 109. RADIO COMMUNICATION. The theory underlying the various sending and receiving systems, and the propagation of electromagnetic waves, combined with experimental work in connection with the department's wireless equipment. First semester (2). Associate Professor Seyfert.

E.E. 110. RADIO COMMUNICATION. Continuation of E.E. 109. Second semester (2). Associate Professor Seyfert.

E.E. 111. ELECTRIC TRANSIENTS. The theory of the transients in the more complicated types of electrical circuits, electrical apparatus and transmission lines, as applied in electrical engineering; oscillograms of all transient phenomena discussed taken in the laboratory. Two lectures and one laboratory period per week. Fee, $6. First semester (3). Assistant Professor Miller.

E.E. 112. ELECTRICAL TRANSIENTS. Continuation of E.E. 112. Fee, $6. Second semester (2). Assistant Professor Miller.

ENGLISH

PROFESSORS SMITH AND LUCH,
ASSISTANT PROFESSOR RILEY, MESSRS. PFANDER, RHOADS, BRAUNLICH, BUTT, DICKSON, FENTON, MAC DOUGALL AND SEVERS

Eng. 0-1-2-3a and 3b. FRESHMAN COMPOSITION AND RHETORIC. The freshmen are distributed, upon the basis of preliminary tests givin during Freshman Week, into three groups: low, middle and high. A schedule of the year's program and credit hours for each group is given below:

Group	First Semester	Credit Hours	Second Semester	Credit Hours
Low	English 0	0	English 1	3
Middle	English 1	3	English 2	3
High	English 3a	3	English 3b	3

English 1 and 2 constitute the minimum freshman requirement. Since no college credit is given for English 0, the students in the low group are required to take English 2 either in summer session or during the second year in order to complete the six required hours. A student whose work shows that he has been placed in the wrong group may be transferred to the higher or to the lower group at any time during the year, if his instructor recommends and the head of the department approves the transfer. First and second semesters (3).

Eng. 4. A STUDY OF THE DRAMA. Reading and critical study of types of the drama; theories of the drama; the drama and the stage; the drama as a criticism of life. Required of English majors. Prerequisites: Eng. 1 and 2. First semester (3).

Eng. 5. A STUDY OF THE DRAMA. Continuation of Eng. 4. Second semester (3).

Eng. 6. THE MODERN ESSAY. An advanced composition course in writing essays and narrative types, with a study of leading modern essayists. Prerequisites: Eng. 1 and 2. First semester (3).

Eng. 7. THE SHORT STORY. An advanced composition course in narration, principally the short story. Study of short stories and their authors. Second semester (3).

Eng. 8. WRITING FOR BUSINESS. An advanced composition course designed to meet the practical writing needs of business and professional men and engineers; reporting scientific and business news. Prerequisites: Eng. 1 and 2. First semester (3).

Eng. 9. WRITING FOR BUSINESS. Repetition of Eng. 8. Second semester (3).

Eng. 10. PUBLIC SPEAKING. A course for a limited number of students who wish to follow the oral composition of the freshman year with special study of the oration; the public address, formal and informal; impromptu speaking; preparation for the Junior Oratorical Contest. Collateral reading. Prerequisites: Eng. 1 and 2. First semester (3).

Eng. 11. PUBLIC SPEAKING. Practice in the forms of address; argumentation and debate. Second semester (3).

Eng. 15. HISTORY OF ENGLISH LITERATURE. An outline course; recitations, lectures and assigned parallel readings. Summer session (3).

Eng. 16. ENGLISH LITERATURE FROM 1800 TO THE PRESENT. A critical study of nineteenth and twentieth century English literature. Summer session (3).

Eng. 17. CONTEMPORARY DRAMA. A critical study of contemporary drama. Summer session (3).

Eng. 18. THE NOVEL. A critical study of types of the novel. Reading and reports; lectures on the history of the novel in England and America. Prerequisites: twelve semester hours of English, preferably Eng. 1 and 2; 4 and 5. Given in 1929-1930. First semester (3).

Eng. 19. THE NOVEL. Continuation of Eng. 18. Second semester (3).

Eng. 20. AMERICAN LITERATURE FROM 1607 TO 1855. Lectures, textbook and supplementary reading. Prerequisites: Eng. 1 and 2. Given in 1928-1929. First semester (3).

Eng. 21. AMERICAN LITERATURE FROM 1855 TO THE PRESENT. Lectures, textbook and supplementary reading. Prerequisites: Eng. 1 and 2. Given in 1928-1929. Second semester (3).

Eng. 25. ENGLISH LITERATURE OF THE ROMANTIC ERA. Prerequisites: twelve hours of English, preferably 1 and 2; 4 and 5. Given in 1929-1930. First semester (3).

Eng. 31. MILTON AND THE SEVENTEENTH CENTURY. A survey of the life and literature of the seventeenth century; a critical study of Milton and Dryden. Prerequisites: twelve hours of English, preferably Eng. 1 and 2, or 3a and 3b; 4 and 5. Given in 1928-1929. First semester (3).

Eng. 32. EIGHTEENTH CENTURY LITERATURE. A study of the writings of Pope, Swift and other Augustans, followed by a study of Dr. Johnson and his Circle. Prerequisites: twelve hours of English, preferably Eng. 1 and 2, or 3a and 3b; 4 and 5. Given in 1928-1929. Second semester (3).

Eng. 43. NEWSPAPER REPORTING AND WRITING. A beginning course in newspaper journalism. During the three hour laboratory period the class will organize into a newspaper staff and "cover" the city of Bethlehem; all the phases of gathering and writing news for publication in a newspaper will be studied; field trips will be taken to local newspaper plants; leading American newspapers will be studied and compared. Prerequisites: Eng. 1 and 2. First semester (3).

Eng. 44. NEWSPAPER REPORTING AND WRITING. Continuation of Eng. 43. A laboratory course in the reporting and writing of particular types of news and stories. Second semester (3).

Eng. 45. MAGAZINE WRITING AND THE FEATURE ARTICLE. Open to students who have completed Eng. 8 or 9 or 43. Second semester (3).

Eng. 46. NEWSPAPER EDITING. An advanced course in newspaper journalism for students who have completed Eng. 43 and 44. During the laboratory period members of the class will act as editors and copy readers with members of Eng. 43 as their staff. Considerable attention will be paid to matters of newspaper ethics. First semester (3).

Eng. 47. NEWSPAPER EDITING. Continuation of Eng. 46. Second semester (3).

For Advanced Undergraduates and Graduates

Eng. 22. ENGLISH LITERATURE OF THE VICTORIAN AGE. Prerequisites: twelve hours of English, preferably 1 and 2; 4 and 5. Given in 1929-1930. Second semester (3).

Eng. 23. SHAKESPEARE. A rapid reading of Shakespeare's minor plays, and a critical study of the principal tragedies and comedies. Prerequisites: twelve semester hours of English, preferably 1 and 2; 4 and 5. Required of English majors. First semester (3).

Eng. 24. SHAKESPEARE. Continuation of Eng. 23. Second semester (3).

Eng. 27. OLD ENGLISH LITERATURE. A study of the history and literature of the Anglo-Saxon period in Old English and in translation, with special attention to the types of Old English poetry. First semester (3).

Eng. 28. MIDDLE ENGLISH LITERATURE. A study of the literature of the Middle English period with chief attention to Chaucer. Second semester (3).

Eng. 29. LITERARY CRITICISM. A course aimed to correlate and unify the student's previous work in literature by means of wide reading in critical literature and discussions of theories and schools of criticism. Prerequisites: eighteen semester hours of English chosen preferably from 4-5; 18-19; 20-21; 22; 23-24; 25; 27-28; 31-32. Required of English majors in the honor group. First semester (3).

Eng. 30. LITERARY CRITICISM. Continuation of Eng. 29. Second semester (3).

FINE ARTS

ASSISTANT PROFESSOR HOWLAND

F.A. 1. History and Appreciation of the Fine Arts. Presentation of elementary principles that will enable the beginner to attain some knowledge and enjoyment of the fine arts; the historical development of art traced through the ancient and mediaeval periods. Lectures. First semester (3).

F.A. 2. History of the Fine Arts. Continuation of F.A. 1. The art of the Renaissance and Modern periods. Second semester (3).

F.A. 3. History of Architecture. Lectures covering the development of architecture from its beginnings in Egypt and Mesopotamia, through Greece and Rome to the Early Christian period, touching upon the building of the Orient. First semester (3).

F.A. 4. History of Architecture. Continuation of F.A. 3. Romanesque and Gothic architecture, the Renaissance, and developments down to present day building. Second semester (3).

F.A. 5. Freehand Drawing. Elementary freehand perspective, followed by drawing from still life objects in pencil, charcoal, and in the various modes; delineation, form, color-value. First semester (3).

F.A. 6. Freehand Drawing. Further practice in expression; color theory with simple exercises in water color. Second semester (3).

FRENCH

See Romance Languages

GEOLOGY

PROFESSOR MILLER

ASSISTANT PROFESSORS TURNER AND FRETZ,

MR. BURRILL

Geol. 1. Mineralogy. The principles of crystallography with practice in determination of forms of models and crystals; the physical properties, origin, occurrence, association and alteration of minerals; a study of about two hundred of the common mineral species and varieties, with practice in identification based on physical and chemical properties. Student should have had Chem. 1 or 3 and 11 or 13. Fee, $5. First semester (4).

Geol. 1a. MINERALOGY. Similar to Geol. 1. Fee, $5. First semester (3).

Geol. 2. BLOWPIPE ANALYSIS. A course in qualitative blowpipe analysis in which the chemical and physical behavior of the common chemical elements and their compounds is noted; methods of rapid qualitative tests for the identification of minerals and chemical compounds with the aid of the blowpipe. Student should have had Chem. 1 or 3 and 11 or 13 and 20. Fee, $2. First semester (1).

Geol. 4. GENERAL GEOLOGY. A course in dynamic, structural and historical geology. Text-book, supplemented by illustrated lectures in which the relation of geology to engineering problems is discussed. Second semester (2).

Geol. 5. PETROLOGY. Macroscopic study of igneous, sedimentary and metamorphic rocks; their origin, classification and identification. Concurrent with Geol. 4. Prerequisite: Geol. 1. Second semester (1).

Geol. 6. GEOLOGICAL FIELD TRIPS. The region affords excellent examples of varied structures and contains numerous quarries where slate, cement rock, limestone, sandstone, gneiss and serpentine are obtained, and gravel, sand and clay pits. When weather conditions prevent out-door work, in-door laboratory exercises are substituted. Concurrent with Geol. 4. Fee, $1. Second semester (1).

Geol. 7. NON-METALLIC ECONOMIC GEOLOGY. A study of the origin, modes of occurrence, properties, sources, production and uses of non-metallic mineral products. The major portion of the course devoted to coal and petroleum. Prerequisites: Geol. 1, 4, 5 and 6. First semester (2).

Geol. 16. PHYSIOGRAPHY. A study of the origin, history and economic significance of topographic features, soils and natural resources. A conference period each week is devoted to instruction and practice in the interpretation and construction of topographic maps. First semester (3).

Geol. 17. ENVIRONMENTAL GEOGRAPHY. Meteorology, climatology and geographical location are considered separately.

This is followed by a consideration of these and other factors constituting the natural environment, in their effect upon man. Laboratory and field exercises. Prerequisite: Geol. 16 or 4. Second semester (3).

For Advanced Undergraduates and Graduates

Geol. 8. METALLIC ECONOMIC GEOLOGY. A study of the geological occurrence, distribution, uses and commercial production of the metalliferous minerals; consideration of the most important mining districts. Recitations, illustrated lectures, field trips and laboratory examination of ore specimens from representative districts of North and South America; visits to the zinc mines of Franklin Furnace, N. J., and Friedensville, Pa., the magnetite mines of Dover, N. J., and Cornwall, Pa., and the anthracite coal regions. Prerequisites: Geol. 1, 4 and 5. Second semester (3).

Geol. 9. PALEONTOLOGY. An elementary course in which the plant and animal life of the past is considered from both the biological and geological viewpoint; theories of the origin and evolution of life; principles of stratigraphy and paleontology; study in the laboratory of index fossils of the successive geologic periods. Prerequisite: Geol. 4. Second semester (3).

Geol. 10. STRATIGRAPHIC GEOLOGY. The geological age and geographical distribution of the rocks of the North American continent; the structure and history of its mountain ranges; the history of its geological development. For those who have not already had Geol. 9, a few weeks are devoted to a study of evolution and the characteristic fossil forms. Prerequisite: Geol. 4. Second semester (2).

Geol. 11. FIELD GEOLOGY. Practice in the actual mapping of surface geology, each student being assigned a definite area and required to prepare a report on the assigned area accompanied by a geological map with structure sections; collection by each student of a full set of specimens to illustrate the geology. The first part of the course devoted exclusively to field work; the notes and specimens studied in the laboratory when the weather prevents further out-door work. Prerequisites: Geol. 4, 5 and 6. Fee, $1. First semester (2).

Geol. 12. PETROGRAPHY. The optical properties of minerals and their study with the petrographic microscope; petrography of the most important igneous rocks. Lectures, recitations and laboratory work. Prerequisites: Geol. 1 and 5. Fee, $3. First semester (2).

Geol. 14. STRUCTURAL GEOLOGY. The study of special features of structural geology in the field and laboratory. Prerequisites: Geol. 4 and 6. First semester (1).

Geol. 15. GEOLOGIC METHODS. Methods used by the United States Geological Survey and by the mining companies that employ geologists; special attention to the problems that confront an economic geologist in the investigation of coal lands, oil properties, metal mines, etc. Prerequisite: Geol. 11. First or second semester (1).

For Graduates

Geol. 120. GEOLOGICAL INVESTIGATION. The investigation and study of the literature of some special geological problem. Field and laboratory work on some district; map of a limited area; an investigation of the microscopic character and general structural features of the rocks which are exposed; presentation of a thesis or dissertation embodying these results. Preparation required dependent upon the nature of the problems to be studied. Prospective students for this course should first consult the professor in charge. First semester (4). Professor Miller.

Geol. 121. GEOLOGICAL INVESTIGATION. Continuation of Geol. 120. Second semester (4). Professor Miller.

Geol. 122. ADVANCED ECONOMIC GEOLOGY. Advanced work in ore deposits. Study of the literature and of the theories of ore deposition, together with detailed work on the type occurrences of some of the metallic or non-metallic minerals; thorough investigation and report on some mining district with special regard to the origin of the ores and such commercial aspects of the deposits as may depend chiefly on the geology; microscopic study of and preparation of specimens of ores. Prerequisites: Geol. 7 and 8. First semester (6). Professor Miller.

Geol. 123. ADVANCED ECONOMIC GEOLOGY. Continuation of Geol. 122. Second semester (6). Professor Miller.

Geol. 124. ADVANCED PETROGRAPHY. A critical study of recent advances in petrographic methods and nomenclature; preparation of detailed report on a selected problem. Prerequisites: Geol. 1, 4, 5 and 12. Second semester (3). Assistant Professor Turner.

Geol. 125. ADVANCED PHYSIOGRAPHY. The detailed study of physiographic types and processes. Conferences, reports and thesis, with work in the laboratory and field. Prerequisite: training in elementary physiography and general geology. First semester (4). Professor Miller.

Geol. 126. ADVANCED PHYSIOGRAPHY. Continuation of Geol. 125. Second semester (4). Professor Miller.

Geol. 127. PHYSICAL CRYSTALLOGRAPHY. An advanced course in geometrical and physical properties of crystals, with special reference to the Goldschmidt methods of crystal measurement and projection; study of recent literature on the subject of atomic and crystallographic structure. Prerequisites: Geol. 1, Phys. 6 and 7. First semester (4). Assistant Professor Fretz.

Geol. 128. COAL RESEARCH. A study of the constitution of coal, embracing a review of the literature and the preparation and microscopical examination of thin sections and polished surfaces. First or second semester (3). Assistant Professor Turner.

Geol. 129. COAL RESEARCH. Continuation of Geol. 128. First or second semester (3). Assistant Professor Turner.

GERMAN

PROFESSOR PALMER,

ASSOCIATE PROFESSOR MORE, MESSRS. KEGEL AND GILBERT

Ger. 1. ELEMENTARY GERMAN. First semester (3).

Ger. 2. ELEMENTARY GERMAN. Continuation of Ger. 1. Prerequisite: Ger. 1 or the equivalent. Second semester (3).

Ger. 3. INTERMEDIATE GERMAN. German prose and poetry. Heine, Keller, C. F. Meyer, Storm, Heyse. Outside reading. Composition. Prerequisite: Ger. 2 or the equivalent. First semester (3).

Ger. 4. INTERMEDIATE GERMAN. Continuation of Ger. 3. Prerequisite: Ger. 3 or the equivalent. Second semester (3).

Ger. 5. INTERMEDIATE GERMAN. Modern prose. Outside reading; thorough review of German grammar; prose composition. Prerequisite: Entrance German. First semester (3).

Ger. 6. INTERMEDIATE GERMAN. Continuation of Ger. 5. Prerequisite: Ger. 5. Second semester (3).

Ger. 7. GERMAN OF CHEMISTRY. Rapid reading of selected texts on Chemistry. Prerequisite: Ger. 2 or the equivalent. First semester (3).

Ger. 9. GERMAN PROSE AND POETRY. Rapid reading of representative texts; collateral reading. Prerequisite: Ger. 4 or 6. First semester (3).

Ger. 10. GOETHE'S FAUST. Study of Part 1. Lectures on the origin and development of the Faust story; collateral reading. Prerequisite: Ger. 3, 4 or 6, or the equivalent. Second semester (3).

Ger. 21. METHODS IN GERMAN. A course for prospective teachers. Advanced German grammar, German composition, conversation, methods of teaching, and discussion of textbooks. Prerequisite: Ger. 10 or the equivalent. Second semester (3).

For Advanced Undergraduates and Graduates

Ger. 11. NINETEENTH CENTURY GERMAN DRAMA. Lectures, reading, reports on assigned work. Prerequisite: Ger. 10 or the equivalent. First semester (3).

Ger. 12. NINETEENTH CENTURY GERMAN DRAMA. Continuation of Ger. 11. Second semester (3).

Ger. 13. LESSING, GOETHE AND SCHILLER. Prerequisite: Ger. 10 or the equivalent. First semester (3).

Ger. 14. LESSING, GOETHE AND SCHILLER. Continuation of Ger. 13. Second semester (3).

Ger. 15. THE GERMAN SHORT STORY. Origin and development. Rapid reading of illustrative stories, with particular attention to Gottfried Keller, Theodor Storm, C. F. Meyer, and Paul Heyse; lectures and reports. Prerequisite: Ger. 10 or the equivalent. First semester (3).

Ger. 16. THE GERMAN SHORT STORY. Continuation of Ger. 15. Second semester (3).

GOVERNMENT

See History and Government

GREEK

PROFESSOR GOODWIN

Gk. 1. Elementary Greek. For freshmen and sophomores who have entered without Greek, but who desire to take up the study in college. They perform in two years approximately the amount of work required for admission from those who present Greek, and are prepared to proceed in the third year with Gk. 5. The introductory book and a small portion of the *Anabasis* studied in the first two semesters. This course will be given only in years when at least six applications are received. Prerequisite: None, but some knowledge of Latin highly desirable. First semester (3).

Gk. 2. Elementary Greek. Continuation of Gk. 1. Second semester (3).

Gk. 3. Second-Year Greek. *Anabasis* continued; *Iliad* (if time permits); grammar and simple composition. Offered only when Gk. 1 and 2 have been given in the preceding year. Prerequisites: Gk. 1 and 2 or one year of entrance Greek. First semester (3).

Gk. 4. Second-Year Greek. Continuation of Gk. 3. Second semester (3).

Gk. 5. Attic Prose. Lysias, selected *Orations*, Xenophon, *Memorabilia*, or some other work. Review of the grammar; composition and other exercises; careful study of Attic prose syntax; special attention given to the formation of correct methods of study and translation, to grammatical analysis, and to the reading aloud of Greek. Available time employed in sight-reading. Herodotus. One book begun. Prerequisites: Gk. 1, 2, 3 and 4, or entrance Greek. First semester (3).

Gk. 6. Herodotus and Plato. Herodotus continued. Study of the forms and syntax of the Ionic dialect. Plato. *Euthyphro*, *Apology*, or other shorter dialogues. Grammar and composition as in the first semester. Prerequisite: Gk. 5. Second semester (3).

Gk. 7. THUCYDIDES. One or more books. Composition. Prerequisites: Gk. 5 and 6. First semester (3).

Gk. 8. TRAGEDY. Euripides. *Medea*, *Bacchae*, or another play. Sophocles. *Oedipus Tyrannus*, *Antigone*, or another. Literary study of the drama; poetical language, style and conception; metrical reading; composition. Prerequisites: Gk. 5 and 6. Second semester (3).

Gk. 9. DRAMATIC POETRY (continued). Aeschylus. *Agamemnon* or *Prometheus Bound*. Aristophanes. *Clouds*, *Frogs*, or *Birds*. Aristophanes as humorist and as moralist, with consideration of the tendencies which he satirized. Metres. Elementary text-criticism. Prerequisites: Gk. 5, 6 and 8. First semester (3).

Gk. 10. GREEK ORATORY. Jebb's *Selections from the Attic Orators*. Demosthenes. Selected orations. Rapid reading, the student being supposed to have reasonable facility in understanding the Greek directly without rendering into English. Attention directed largely to those points which illustrate the development of Greek prose style. Prerequisites: Gk. 5 and 6. Second semester (3).

Gk. 11. HOMER. Rapid reading of considerable portions of the *Iliad* or *Odyssey*. Homeric language, syntax and metre reviewed, with some reference to the needs of intending teachers, but chiefly as a foundation for the study outlined in Gk. 12. Prerequisites: Gk. 5 and 6. First semester (3).

Gk. 12. LYRIC POETRY. Fragments of the Elegiac, Iambic and Melic poets; selections from Pindar or Theocritus. Prerequisites: Gk. 5, 6 and 11. Second semester (3).

Gk. 13. HELLENISTIC GREEK. *New Testament*. Selections from Lucian. To be substituted on occasion for Gk. 12. Prerequisites: Gk. 5 and 6, and the approval of the Professor. Second semester (3).

Courses Gk. 9 and 11, 10 and 12 (or 13) offered in alternate years, and open to both juniors and seniors.

Gk. 31. GREEK HISTORY. Lectures, text-book and readings. For seniors and juniors. Not given in 1927-1928. Second semester (2).

Candidates for honors in Greek will be assigned special readings on request.

For Graduates

Candidates must satisfy the Professor of Greek as to their adequate preparation for the following courses. Ordinarily at least four years of Greek in college will be expected as a prerequisite.

Gk. 101. GREEK POETRY. The development of poetry in Greece from Homer to the Drama, with special study of the Lyric Poets, and collateral reading. First semester (3). Professor Goodwin.

Gk. 102. GREEK POETRY. Continuation of Gk. 101. Second semester (3). Professor Goodwin.

Gk. 103. GREEK PHILOSOPHY. The history of philosophic thought in Greece, particularly in the Pre-Socratic period. Ritter and Preller's *Historia Philosophiae Graecae*, and collateral reading. First semester (3). Professor Goodwin.

Gk. 104. GREEK PHILOSOPHY. Continuation of Gk. 103. Second semester (3). Professor Goodwin.

Gk. 105. HELLENISTIC GREEK. Portions of the *Gospels* in a comparative study, the *Acts*, and selected *Epistles*. Chapters from the *Septuagint*. Patristic literature. Collateral reading. Selections from Lucian. First semester (3). Professor Goodwin.

Gk. 106. HELLENISTIC GREEK. Continuation of Gk. 105. Second semester (3). Professor Goodwin.

HISTORY AND GOVERNMENT

PROFESSOR GIPSON, ASSOCIATE PROFESSOR BROWN,
ASSISTANT PROFESSORS HARMON AND SCHULZ

HISTORY

Hist. 1. MEDIAEVAL HISTORY. The growth of the church; rise of the Papacy; the appearance of Empire; the monastic orders; imperium and sacerdotium; the Crusades; the growth of the French monarchy. First semester (3).

Hist. 2. MEDIAEVAL HISTORY. The Hohenstaufens; the conquest of England; the rise of the Schoolmen; the universities; trade and commerce; mediaeval literature, art, architecture, and ideals; the contribution of the Middle Ages to modern civilization. Second semester (3).

Hist. 5. MODERN HISTORY. General survey of European politics from the Empire of Charles V. to the outbreak of the French Revolution. To alternate with Hist. 1. Not given in 1928-1929. First semester (3).

Hist. 6. MODERN HISTORY. The Napoleonic and Metternichian eras; the nationalism of France, Germany and Italy; colonial expansion; international relations since 1870. Prerequisite: Hist. 5 or by permission. To alternate with Hist. 2. Not given in 1928-1929. Second semester (3).

Hist. 7. HISTORY OF ENGLAND TO 1603. A study of Early Britain, the Anglo-Saxon Heptarchy and customs, the Norman Conquest, development of Parliament, continental wars, and the War of the Roses. Not given in 1928-1929. First semester (3).

Hist. 8. HISTORY OF ENGLAND TO 1603, CONTINUED. The Tudor Dynasty; the breaking-up of the mediæval economy, the Reformation, rise of the middle class, mercantilism and the era of exploration. Not given in 1928-1929. Prerequisite: Hist. 7. Second semester (3).

Hist. 9. HISTORY OF ENGLAND, 1603-1925. The Stuarts and the Protectorate; the new social conditions; conflict between king and Parliament; the Puritan Revolution; Cromwell and the Protectorate. To alternate with Hist. 7. First semester (3).

Hist. 10. HISTORY OF ENGLAND, 1603-1925, CONTINUED. Continental policy in the eighteenth century; the coming of Empire; the industrial revolution; political appearance of the cabinet; colonial expansion. Prerequisite: Hist. 9 or by permission. To alternate with Hist. 8. Second semester (3).

Hist. 13. UNITED STATES HISTORY. The era of constitution making; the evolution of political parties; foreign relations during the wars of the French revolutionary period; the western movement and western state-building; the growth of sectionalism. First semester (3).

Hist. 14. UNITED STATES HISTORY. The war for the Union; the reconstruction of the South; the era of big industry and labor combinations; the United States as a world power; the new national paternalism. Second semester (3).

Hist. 22. QUEEN ELIZABETH AND HER CONTEMPORARIES. A study of the great personalities of this period. Second semester (3).

Attention is called also to the following courses in History offered by other departments: ANCIENT CIVILIZATION by the Department of Latin; ECONOMIC HISTORY by the Department of Economics and Business Administration; GREEK HISTORY by the Department of Greek.

For Advanced Undergraduates and Graduates

Hist. 3. ECCLESIASTICAL HISTORY. The Formative Period. Conditions in the Roman Empire; the Apostolic Age; the period of heresies; the Ante-Nicene Fathers: Arius, Athanasius and the Sabellians. The Council of Nicaea. Prerequisites: Hist. 1 and 2, or by permission. Not given in 1928-1929. First semester (3).

Hist. 4. ECCLESIASTICAL HISTORY. The Period of Growth. The rise of the Papacy; monasticism; Imperium and Sacerdotium; growth of Canon Law; the twelfth century heresies; the Reformation; Council of Trent; subsequent changes. Prerequisite: Hist. 3 or by permission. Not given in 1928-1929. Second semester (3).

Hist. 11. AMERICAN COLONIAL HISTORY. The period of discovery and exploration; rival settlements in North America by Spain, France, England, and Holland; the English colonial proprietors and the colonial charters; the growth of representative government; the beginnings of constitutional controversy. First semester (3).

Hist. 12. AMERICAN COLONIAL HISTORY. The establishment of parliamentary trade restrictions; colonial immigration, trade, and finance; western expansion and the collapse of the French empire in America; the new colonial system and its breakdown; the war for Independence. Second semester (3).

Hist. 15. THE RENAISSANCE. The decline of mediaevalism; revived study of the humanities; influence on literature, art, religion, and society. A seminar course; admission by permission only. Not given in 1928-1929. First semester (3).

Hist. 16. THE REFORMATION. Continuation of Hist. 15. The revolt within the church; its spread to Germany; Luther;

Melancthon; Calvin; the sixteenth century commercial revolution; nationalist tendencies. Prerequisite: Hist. 15. Not given in 1928-1929. Second semester (3).

Hist. 17. THE FRENCH REVOLUTION. The precursors of the Revolution: Quesnay and the Physiocrats, the "Intellectuals," Montesquieu, Voltaire, Rousseau; social and financial chaos. A seminar course. Admission by permission only. First semester (3).

Hist. 18. THE FRENCH REVOLUTION. Continuation of Hist. 17. The Revolution: political and constitutional changes; the spirit of the Jacobins; the Reign of Terror; reactions within France and beyond the Rhine; the submersion of the Republic in the Empire. Second semester (3).

Hist. 19. SEMINAR. Open to students of senior standing who desire to major in history or who have shown ability in one or more of the general survey courses. A brief period of history studied intensively. Subject for 1928-1929: "The British Colonies and the American Revolution." First semester (3).

20. SEMINAR. Continuation of Hist. 19. Second semester (3).

Hist. 29. AMERICAN FOREIGN POLICY. The French alliance; independence and boundaries; commercial restrictions; French Revolution and neutrality; purchase of Louisiana; War of 1812; acquisition of Florida; Monroe Doctrine; relations with France and Great Britain; Oregon and Texas; the Mexican War; manifest destiny; Isthmian diplomacy; China and Japan. Not given in 1928-1929. First semester (3).

Hist. 30. AMERICAN FOREIGN POLICY. Civil War and possible European intervention; Alaska boundary; War with Spain; the new Caribbean policies; the World War; the League of Nations; Washington Conference; the aftermath of the Great War. Not given in 1928-1929. Second semester (3).

Hist. 39. THE CIVIL WAR. Background of the Civil War; Buchanan's policy. Lincoln's attitude; views of Davis; Northern and Southern leaders contrasted. First semester (3).

Hist. 40. RECONSTRUCTION OF THE UNION. Problems of a restored Union; the policy of Johnson; views of the North and South; radical reconstruction; the election of Grant; the Supreme Court and reconstruction; the restoration of white supremacy in the South. Second semester (3).

For Graduates

Students desiring to major in History and Government should have had at least two courses throughout the year in connection with their undergraduate work that bear upon this field of study or in other ways should satisfy the Department that they are in a position to undertake profitably the required program for the master's degree. Students should register for graduate work only after consultation with the Head of the Department.

Hist. 101. ENGLISH INSTITUTIONAL HISTORY. A study of political, social, economic, and religious institutions which have most profoundly influenced American civilization. Not given in 1928-1929. First semester (3). Professor Gipson.

Hist. 102. ENGLISH INSTITUTIONAL HISTORY. Continuation of Hist. 101. Second semester (3). Not given in 1928-1929. Professor Gipson.

Hist. 111. ENGLISH COLONIZATION IN NORTH AMERICA IN THE SEVENTEENTH CENTURY. The activities of the great overseas trading companies; the problem of proprietorial control; the decline of the chartered colonies; conflicts between opposing political, economic, and religious ideals within the colonies. First semester (3). Professor Gipson.

Hist. 112. ENGLISH COLONIZATION IN NORTH AMERICA IN THE SEVENTEENTH CENTURY. Continuation of Hist. 111. Second semester (3). Professor Gipson.

Hist. 113. AMERICA IN THE EIGHTEENTH CENTURY. The workings of the English mercantile system; the evolution of colonial institutions; the international struggle for the fur trade in North America; George III and the new administrative system. Not given in 1928-1929. First semester (3). Professor Gipson.

Hist. 114. AMERICA IN THE EIGHTEENTH CENTURY. Continuation of Hist. 113. Second semester (3). Professor Gipson.

Hist. 115. AMERICAN CONSTITUTIONAL HISTORY. The major problems involved in the growth of the powers of the national government. Not given in 1928-1929. First semester (3). Professor Gipson.

Hist. 116. AMERICAN CONSTITUTIONAL HISTORY. Continuation of Hist. 115. Second semester (3). Professor Gipson.

Hist. 117. America as a World Power. The relations of the United States with Latin America; the problem of the Pacific; the United States and Europe. Not given in 1928-1929. First semester (3). Professor Gipson.

Hist. 118. America as a World Power. Continuation of Hist. 117. Not given in 1928-1929. Second semester (3). Professor Gipson.

GOVERNMENT

Govt. 51. American Government (National). The evolution of the constitution; growth of the powers of the federal judiciary; the machinery of legislation; the scope of the federal administration. First semester (3).

Govt. 52. American Government (State). Colonial basis of state government; the later state constitutions; the decline of the state legislatures; the new type of state administrations; state judicial systems; new forms of local government. Second semester (3).

For Advanced Undergraduates and Graduates

Govt. 53. Political Science. A survey of the chief exponents of political idealism; Aristotle and Plato; the Stoics and Epicurians; and philosophers of the Middle Ages, down to the Eighteenth Century. Open to juniors and seniors, or by permission. Not given in 1928-1929. First semester (3).

Govt. 54. Political Science. A continuation of Govt. 53, bringing the history of political thought down to the present day. Not given in 1928-1929. Second semester (3).

Govt. 55. International Relations. The nature of interstate relations among the peoples of antiquity and during mediaeval and modern times; special emphasis given to those principles underlying intercourse between states. First semester (3).

Govt. 56. International Law. The work of Grotius and his successors; the growth of substantive international law; the World War and international law; the building of machinery for the solution of international problems. Second semester (3).

Govt. 57. Problems of Municipal Management. A study of the various factors involved in the efficient conduct of city government. Special emphasis given to the workings of the city management type of city government. Prerequisite: Govt. 51 and 52. First semester (3).

Govt. 58. PROBLEMS OF MUNICIPAL MANAGEMENT. Examination of the fundamental principles of effective administration; a survey of such municipal problems as city planning, health control, urban transportation, police and fire protection, water supply, and waste collection and disposal. Second semester (3).

ITALIAN

See Romance Languages

LATIN

PROFESSOR WRIGHT, MESSRS. LINDSAY AND SANTEE

Lat. 1a. For freshmen who enter with four years of high-school Latin. PLINY. Selected letters. MARTIAL. Selected epigrams. VERGIL. *Bucolics*. Some study of Roman life under the Empire. The history and development of the epigram and of pastoral poetry; the influence of Latin poetry upon English literature emphasized. First semester (3).

Lat. 1b. For freshmen who elect the course after three years of high-school Latin. VERGIL. *Bucolics* and the *Aeneid* I-VI, or selections from OVID. Practice in reading aloud and scansion; training in sight translation; some study of the mythology and religion of Greece and Rome; the influence of Latin poetry upon English literature emphasized. First semester (3).

Lat. 2. HORACE. Selected *Odes*. Lectures on the history and development of lyric poetry; constant practice in reading the more important lyric metres; memorizing of stanzas and passages from Horace. Second semester (3).

Lat. 3. CATULLUS. Selected poems. PLAUTUS OR TERENCE. One play. A study of the literature and social life of republican Rome; private life of the Greeks and Romans. Prerequisites: Lat. 1 and 2. First semester (3).

Lat. 4. LIVY. Selections from the earlier books. Some study of early Roman history and topography. CICERO. Selected letters. Prerequisites: Lat. 1 and 2. Second semester (3).

Lat. 10. THE TEACHING OF HIGH SCHOOL LATIN. Discussion of aims, content and methods, and of the standard texts used in preparatory school Latin, with a consideration of the report of The Classical Investigation, of Lodge's *Vocabulary of High School Latin*, and of Byrne's *Syntax of High School Latin*. Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 3 and 4. First semester (3).

Lat. 11. ENGLISH WORDS DERIVED FROM THE LATIN. A course intended to give the student some familiarity with those Latin words that have contributed most largely in derivatives to the English language and to teach the intelligent use of the English dictionary. Elective for all students; no previous knowledge of Latin required. First semester (3).

Lat. 21. ANCIENT CIVILIZATION. A course aiming to impart a knowledge of ancient life and thought, in all its phases. Required reading in the best English translations of ancient authors. Assigned topics for investigation and report; lectures on the art, architecture and daily life of the ancients, illustrated by stereopticon. First semester (3).

Lat. 22. ANCIENT CIVILIZATION. Continuation of Lat. 21. Second semester (3).

Lat. 1a and 2 are required of freshmen in the B.A. curriculum who enter with four units of Latin; others in that curriculum take Lat. 21 and 22, except that those who prefer may, with the approval of the Professor of Latin, begin or continue Latin instead.

Lat. 31. BEGINNING LATIN. Special emphasis on English derivatives and the principles of grammar. First semester (3).

Lat. 32. CAESAR. *The Gallic War*. Books I-IV. Prose composition and syntax. Second semester (3).

Lat. 33. CAESAR. One or two of the later books of the *Gallic War* or selections from the *Civil War*. CICERO. Orations. Prose composition and syntax, with special emphasis on clause construction. A course designed for students who enter with two years of high school Latin and who elect to continue their Latin rather than take Lat. 21. First semester (3).

Lat. 34. CICERO. Continuation of Lat. 33. Orations; *de Senectute* or *de Amicitia*. Second term (3).

For Advanced Undergraduates and Graduates

Lat. 5. SATIRE. Selected satires of Horace and Juvenal. Lectures on the history of Roman satire and its influence on modern literature. Study of social conditions under the Empire. Prerequisites: Lat. 3 and 4. Given in 1928-1929. First semester (3).

Lat. 6. ROMAN PROSE WRITERS OF THE EMPIRE. Selections from the following: Petronius, *Cena Trimalchionis;* Apuleius, Cupid and Psyche story from the *Metamorphoses;* Suetonius, *Lives;* Seneca, *Moral Epistles* and *Dialogues;* Tacitus, *Germania.* Prerequisites: Lat. 3 and 4. Given in 1928-1929. Second semester (3).

Lat. 7. VERGIL. *Aeneid,* Books VII-XII. Continuation of Lat. 8. Given in 1927-1928. Second semester (3).

Lat. 8. LUCRETIUS. The finest literary passages and selected passages illustrating his philosophy. ENNIUS and some study of early Roman epic. VERGIL'S sixth *Aeneid.* An intensive study of its debt to Greek literature, religion and philosophy, and its influence on modern literature. Lectures on the history of the epic; collateral reading in the great epics of other literatures. Prerequisites: Lat. 3 and 4. Given in 1927-1928. First semester (3).

Lat. 9. LATIN PROSE COMPOSITION. Exercises in translating from English into Latin, with a collateral study of Latin grammar. Special attention to clause construction and other points of syntax. Students preparing to teach Latin are expected to elect this course. Prerequisites: Lat. 3 and 4. Given in 1928-1929. First semester (3).

MATHEMATICS AND ASTRONOMY

PROFESSORS FORT, OGBURN AND REYNOLDS,
ASSOCIATE PROFESSORS STOCKER AND SMAIL,
ASSISTANT PROFESSORS KNEBELMAN,* WEIDA AND LAMSON,
MESSRS. KICHLINE, PARADISO, RIDDLE, BARNES,
NORDSTROM AND THOMPSON

The major in mathematics in the College of Arts and Science consists in all of at least twenty-four semester hours college credit in mathematics. This must include courses 1, 2, 3 and 4, except that a student who has entrance credit in plane trigonometry does not take Math. 1 and a student who has entrance credit in advanced algebra does not take Math. 2. The twelve hours advanced credit required by the regulations of the College must be from mathematics courses given at Lehigh University other than Math. 15, 16, 1, 2, 3 and 4.

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* Absent on leave 1927-1928.

The major in mathematics and astronomy consists of at least twenty-four semester hours college credit in mathematics and astronomy. It must include Math. 1, 2, 3 and 4 and Astr. 2 and 3, except that students having entrance credit in plane trigonometry or advanced algebra do not take Math. 1 or 2 as above. The twelve hours advanced credit required shall not include Math. 15, 16, 1, 2, 3, 4 or Astr. 1.

The College of Engineering requires plane trigonometry and solid geometry for entrance. A student entering the freshman class in the College of Engineering normally takes Math. 2. If, however, he presents advanced algebra for entrance credit he enters Math. 3, substituting for Math. 2 at some time a mathematics course for which he has the prerequisites or some other free elective.

A placement examination is given each year during Freshman Week to all freshmen who present plane trigonometry for entrance. This examination stresses trigonometry but includes some questions on solid geometry. Students who do not make a reasonable showing on this examination are required to take Math. 1 instead of Math. 2.

MATHEMATICS

Math. 1. Plane Trigonometry. Each semester (3).

Math. 2. Algebra. Beginning with the theory of quadratic equations. Prerequisite: Math. 1, or entrance credit in plane trigonometry. Each semester (3).

Math. 3. Analytic Geometry. The usual elementary course treating among other things the straight line, the conic sections and some three dimensional geometry. Prerequisite: Math. 2. Each semester (3).

Math. 4. Elements of Calculus. The formal rules of differentiation and of integration with simple applications. Prerequisite: Math. 3. Each semester (3).

Math. 5. Applications of Calculus. Maxima and minima, rates, lengths, areas and volumes of figures of revolution;

double and triple integrals, centers or gravity, moments of inertia, etc. Prerequisite: Math. 4. Each semester (3).

Math. 6. ADVANCED CALCULUS. Theorem of the Mean, Taylor's Theorem, manipulation of power series, etc.; elementary differential equations. Prerequisite: Math. 5. Each semester (3).

Math. 15. READING COURSE IN MATHEMATICS. Credit not to exceed one hour per semester, total credit not to exceed three hours, approval of program and written report required.

Math. 16. SOLID AND SPHERICAL GEOMETRY AND SPHERICAL TRIGONOMETRY. Open to all students, particularly advised for students of astronomy. One semester (3).

Math. 21. ANALYTIC MECHANICS. Differential equations of motion, treatment of forces in space, free and constrained motion of a particle and of masses, with applications to practical problems. Prerequisites: Math. 5 and 6. Each semester (3).

Math. 41. MATHEMATICS OF FINANCE. Annuities, sinking funds, amortization, etc., life insurance. Prerequisite: Math. 2. First semester (3).

Math. 42. MATHEMATICAL STATISTICS. Prerequisite: Math. 2. Second semester (3).

Math. 51. ADVANCED ALGEBRA. Complex numbers, theory of equations with applications to classical problems, Sturm's theorem, etc., determinants and the theory of resultants. Prerequisite: Math. 2. One semester (3).

Math. 52. PROJECTIVE GEOMETRY. Fundamental ideas and theorems of this great geometric method. Prerequisite: Math. 3. One semester (3).

Math. 53. SECOND COURSE IN ANALYTIC GEOMETRY. More complete treatment of conic sections and higher plane curves than is possible in Math. 3. Additional work on solid analytic geometry. One semester (3).

Math. 54. HISTORY OF ELEMENTARY MATHEMATICS. Prerequisite: Math. 2. One semester (3).

For Advanced Undergraduates and Graduates

Math. 11. ADVANCED DIFFERENTIAL EQUATIONS. Special solvable nonlinear equations, linear equations, transformations and symbolic methods, solutions in series, Riccati's, Bessel's and Legendre's equations, partial differential equations. Prerequisite: Math. 6. First semester (3).

Math. 12. ADVANCED DIFFERENTIAL EQUATIONS. Continuation of Math. 11. Fourier series, cylindrical and spherical harmonics. Second semester (3).

Math. 22. ADVANCED ANALYTIC MECHANICS. Prerequisite: Math. 21. First semester (3).

Math. 23. ADVANCED ANALYTIC MECHANICS. Continuation of Math. 22. Second semester (3).

Math. 24. THEORY OF ERRORS AND LEAST SQUARES AND EMPIRICAL FORMULAS. Probability and its relation to precision, development of the theory of least squares and its application in the study of errors, the formation of empirical formulas from given or observed data. Designed for students engaged in experimental or observational work. Prerequisite: Math 6. Second semester (3).

For Graduates

To major in the Department of Mathematics and Astronomy, and obtain a master's degree in one year, a graduate student must present evidence of having completed the equivalent of the work required in this department of graduates of the College of Arts and Science who majored in Mathematics or Mathematics and Astronomy. Graduate students who cannot satisfy these requirements but who desire to major in Mathematics or Mathematics and Astronomy may take preliminary courses for which they are prepared, but cannot expect to complete the requirements for a master's degree in one year.

Math. 100. FUNDAMENTAL CONCEPTS OF MATHEMATICS. (3). Professor Fort.

Math. 101. VECTOR ANALYSIS. The theory and methods of vector analysis as applied in physics and pure mathematics. Prerequisite: Math. 6. (3) Professor Reynolds or Associate Professor Smail.

Math. 102. VECTOR ANALYSIS. Continuation of Math. 101. (3). Professor Reynolds or Associate Professor Smail.

Math. 106. NUMERICAL INTEGRATION. Theory and practice of numerical methods applied to otherwise intractable problems, with special reference to the solution of differential equations. Prerequisite: Math. 12. (3). Assistant Professor Weida.

Math. 109. MATHEMATICS SEMINAR. Reports on special topics of the literature and of individual research. Prerequisite: graduate standing and consent of the instructor. (3). Professor Fort or Professor Reynolds or Associate Professor Smail or Assistant Professor Lamson.

Math. 110. MATHEMATICS SEMINAR. Continuation of Math. 109. (3). Professor Fort or Professor Reynolds or Associate Professor Smail or Assistant Professor Lamson.

Math. 111. INFINITE PROCESSES. Fundamental limit notions applied to various infinite processes. (3). Professor Fort or Associate Professor Smail.

Math. 112. INFINITE PROCESSES. Continuation of Math. 111. (3). Professor Fort or Associate Professor Smail.

Math. 115. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE. (3). Professor Fort or Associate Professor Smail.

Math. 116. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE. Continuation of Math. 115. Prerequisite: Math. 115. (3). Professor Fort or Associate Professor Smail.

ASTRONOMY

Astr. 1. DESCRIPTIVE ASTRONOMY. An elementary illustrated lecture course, open to all students. May not be substituted for Astr. 2. Second semester (3).

Astr. 2. GENERAL ASTRONOMY. Fundamental facts and principles of the subject with solution of problems using calculus; observatory visits. Prerequisite: Math. 4. Second semester (3).

Astr. 3. PRACTICAL ASTRONOMY. Instruments used; methods of taking and reducing observations to determine time, latitude and azimuth; observatory work in which each student makes his own observations and computations in illustration of the problems studied. As this course is primarily for civil engineers, the sextant and engineer's transit are the chief instruments employed in the observational work. Prerequisites: Astr. 2 and Math. 5. First semester (3).

For Graduates

Astr. 101. ASTRONOMY SEMINAR. The study of instruments and methods used in the determination of time, latitude, longitude and azimuth; practical work in the observatory, to give facility in making and reducing observations. Prerequisite: Astr. 3. (3). Professor Ogburn.

Astr. 102. Astronomy Seminar. Continuation of Astr. 101. (3). Professor Ogburn.

MECHANICAL ENGINEERING

PROFESSOR LARKIN, KLEIN, BUTTERFIELD AND STUART,
ASSISTANT PROFESSORS LEACH,* KING AND AULT,
MESSRS. BAILEY, JENNINGS, LUCE AND GJESDALL

M.E. 1. Elementary Machine Design. A course in the development of the mathematics of machine construction and the practical application of the design of machine elements, such as shafts, keys, couplings, gears, etc., with sufficient drawing-room work to teach the correct method of detailing and dimensioning original designs. Prerequisite: Phys. 1. First semester (3).

M.E. 2. Elementary Heat Engines. Classification and types of engines, governors, valve gears, valve diagrams, indicator diagrams, efficiency. Fuels, combustion, boilers, superheaters, feed water heaters, condensers. Prerequisite: Phys. 2. First semester (3).

M.E. 4. Elementary Machine Design. A continuation of M.E. 1, including the design of worm gearing, belts, pulleys, bearings, connecting rods, fly-wheels, etc. Prerequisite: Phys. 1. Second semester (3).

M.E. 5. Heat Engines. Continuation of M.E. 2. Second semester (3).

M.E. 6. Mechanism. A study of the kinematic relations of machine parts. Determination of the relative motion of links in a mechanism; development of cams, gears and transmission machinery from the standpoint of motion only; practical problems developed in the drawing room. Prerequisite: M.E. 1. Second semester (4).

M.E. 9. Engineering Laboratory. Use and calibration of apparatus for measuring weight, volume, pressure, temperature, speed, etc., for engineering purposes. Prerequisite: M.E. 2. Fee, $3.50. First semester (1).

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* Absent on leave 1927-1928.

M.E. 10. THERMODYNAMICS. The relations between pressure, volume, temperature, work and heat for special changes of state; establishment of the fundamental equations of thermodynamics and their adaptation to gases, saturated and superheated vapors. Technical problems. Prerequisite: M.E. 5. First semester (3).

M.E. 11. ENGINEERING LABORATORY. Continuation of M.E. 9. Indicator practice on engines in the laboratory and in factories and power plants in the neighborhood; complete working up of indicator diagrams from simple and compound engines, air compressors, etc. Prerequisite: M.E. 2. Fees, $3.50. Second semester (1).

M.E. 15. THESIS. Candidates for the degree of B.S. in M.E. may, with the approval of the department, undertake a thesis as a portion of the work during the second semester of the senior year. Prerequisites: C.E. 9, M.E. 10. Second semester (3).

M.E. 19. ENGINEERING LABORATORY. A one semester course selected from the laboratory exercises, for students who take the work only one semester. Prerequisite: M.E. 2, or the equivalent. Fee, $3.50. First semester (1) or second semester (1).

M.E. 21. ENGINEERING LABORATORY. A shorter course, selected and condensed from the laboratory exercises, especially in steam engineering. Prerequisite: M.E. 2 or the equivalent. Fee, $3.50. First semester (1).

M.E. 22. HEAT ENGINES. Short course covering steam engines, steam turbines, internal combustion engines and boiler plants. Prerequisite: Phys. 2. First semester (3).

M.E. 23. HEAT ENGINES. Completion of M.E. 22. Prerequisite: Phys. 2. Second semester (3).

M.E. 24. ENGINEERING LABORATORY. A series of experiments and tests of heat transfer, apparatus, calorimetry, heat engines and auxiliaries. Prerequisite: M.E. 2 or the equivalent. Fee, $3.50. Summer session: eight hours of laboratory work each week-day for four weeks, beginning June 4, 1928. Tuition fee, $40. (4)

M.E. 25. ENGINEERING LABORATORY. Completion of M.E. 21, along the same lines. Prerequisite: M.E. 5 or the equivalent. Fee, $3.50. Second semester (1).

M.E. 27. STUDENT APPRENTICESHIP OR ENGINEERING CONSTRUCTION OR SHOP WORK. Following the junior year, students are required to do a minimum of eight weeks of practical work, preferably as student apprentices, in the work they plan to follow after graduation. A report typewritten and bound is required.

M.E. 29. HEAT ENGINES. A one semester course for non-Mechanical students covering the elementary principles of power plants and auxiliaries. First semester (3) or second semester (3).

M.E. 30. MECHANISM. A comprehensive course in the kinematic relation of machine elements, such as gears, links, belts, cams, etc., with representative problems worked in the drawing room. Prerequisite: Phys. 1. Second semester (3).

For Advanced Undergraduates and Graduates

Graduate students desiring to take the following courses should present as prerequisites: Integral Calculus, Mechanics of Materials and Elementary Heat Engines.

M.E. 8. HEAT ENGINES. Theory of steam turbines, internal combustion engines, gas producers and refrigeration. Class and drawing-room work. Prerequisite: M.E. 5 or the equivalent. Second semester (3).

M.E. 12. ADVANCED MACHINE DESIGN. The design of machines in general with special attention to the application of underlying fundamentals in strength to specific problems, practical considerations and the use of standards. Problems covering such machines as hoists, machine tools, hydraulic machines, etc., are worked in a drawing room conducted on the lines of a modern commercial drafting room. Prerequisites: M.E. 4, C.E. 9. First semester (4).

M.E. 13. MECHANICAL ENGINEERING. Advanced work in thermodynamics, internal combustion engines and steam turbines, with typical problems. Prerequisites: Math. 6, M.E. 10. First semester (3).

M.E. 14. ENGINEERING LABORATORY. Work of M.E. 9 and 11 continued. Tests of boilers, power plants and pumping stations in the neighborhood. Prerequisite: M.E. 9. Fee, $3.50. First semester (2).

M.E. 16. ADVANCED MACHINE DESIGN. A continuation of M.E. 12, with special emphasis on the effect of eccentric loading and inertia forces on the dimensions of machine parts. Prerequisites: M.E. 4, C.E. 9. Second semester (4).

M.E. 17. MECHANICAL ENGINEERING. Continuation of M.E. 13. Advanced work in pumping machinery, air machinery and refrigeration, with typical problems. Prerequisites: Math. 6, M.E. 10. Second semester (3).

M.E. 18. ENGINEERING LABORATORY. Work of M.E. 14 carried forward along the same lines. Analysis of flue gases; complete tests of power plants in the vicinity. Prerequisite: M.E. 11. Fee, $3.50. Second semester (2).

For Graduates

M.E. 100. ADVANCED ENGINEERING THERMODYNAMICS. The development of certain methods of thermodynamics which find particular application in the field of Mechanical Engineering. Energy equations; availability and entropy; general equations; formulation of vapor properties; action of steam in nozzles and turbines; supersaturation; gas properties; gas reactions in combustion. Prerequisite: graduate standing in engineering. First semester (3). Professor Stuart.

M.E. 101. ADVANCED ENGINEERING THERMODYNAMICS. Continuation of M.E. 100. Second semester (3). Professor Stuart.

M.E. 103. INTERNAL COMBUSTION ENGINES. Early inventions and inventors; development of gas engine, vapor engine, heavy oil engine, stationary, portable, self propelled vehicles on land, on water, in air; cycles; laws of mixing, carburetion, atomization; combustion and laws of chemical equilibrium; detonation; heat losses; friction losses in fluids and solids; governing; relay systems. Prerequisite: M.E. 10. First semester (3). Professor Butterfield.

M.E. 104. INTERNAL COMBUSTION ENGINES. Continuation of M.E. 103. Diesel engine design. Two-stroke cycle, four-stroke cycle, scavenging, compressing, injection, reversing. Marine engines, locomotive engines, stationary engines. Balancing forces and energy flow. Heaters, superchargers, ignition, cooling. Prerequisites: M.E. 10 and 16. Second semester (3). Professor Butterfield.

M.E. 105. THEORETICAL MACHINE DESIGN. The precise design of intricate machine parts from an analytical point of view, bringing to bear the application of analytical mechanics and the theory of elasticity in the determination of localized dynamic and complex stresses. Prerequisite: graduate standing. First semester (3). Assistant Professor Leach.

M.E. 106. THEORETICAL MACHINE DESIGN. Continuation of M.E. 105. Second semester (3). Assistant Professor Leach.

METALLURGICAL ENGINEERING

PROFESSOR STOUGHTON,

ASSISTANT PROFESSORS BUTTS AND DOAN, MR. LEVY

Met. 1. GENERAL METALLURGY. A course of lectures discussing the apparatus and general principles of metallurgy. Ores, fuels, combustion, pyrometry, refractories, furnaces, metallurgical processes and products, metals and alloys, slags and fluxes, blast and gases, smoke and fume. Prerequisites: Chem. 1 or 3, Phys. 2 and 4. Second semester (2).

Met. 2. METALLURGY OF IRON AND STEEL. Chemical and physical properties of iron. Iron ores, preparation of ores, the blast furnace, the mixer, remelting, refining, puddling, the Bessemer process, the open-hearth process, duplex process, cementation, manufacture of crucible steel, electric steel, alloy steels, casting, forging and heat treatment. Prerequisite: Met. 1. First semester (2).

Met. 3. METALLURGY OF COPPER, LEAD, GOLD AND SILVER. COPPER: Chemical and physical properties, ores, smelting sulphide ores, the Bessemer process, treatment of oxide ores, wet process, electrolytic processes. LEAD: Chemical and physical properties, ores, smelting processes, condensation of lead fume, refining and desilverization of base bullion. GOLD: Chemical and physical properties, ores, gold washing, gold milling, amalgamation, the cyanide process, parting and refining gold and silver. SILVER: Chemical and physical properties, ores, smelting, amalgamation, leaching processes. Prerequisite: Met. 1. First semester (2).

Met. 4. METALLURGY OF ZINC, ALUMINIUM AND THE MINOR METALS. ZINC: Chemical and physical properties, ores, reduction by furnace and electrolytic processes, electrothermic processes, manufacture of zinc oxide. MERCURY: Chemical and physical properties, ores, processes of extraction. ALUMINIUM: Chemical and physical properties, ores, extraction by electrolysis. TIN, NICKEL, PLATINUM, ANTIMONY, etc.; Chemical and physical properties, ores, processes of extraction. Prerequisite: Met. 1. Second semester (2).

Met. 5. ELECTROCHEMISTRY. Lectures and recitations concerning the phenomena of electrolysis and electrolytic conduction; current phenomena; voltage phenomena; energy relations; electrode reactions; the electrolytic cell; primary cells and storage batteries; electric arcs and discharges through gases. Prerequisites: Chem. 1 or 3, Phys. 2 and 4. First semester (1).

Met. 21. ENGINEERING METALLURGY. An abridgement of Met. 1, 2, 3 and 4, especially adapted to the viewpoint of users of metals. Prerequisite: Chem. 1. First or second semester (2).

Met. 23. ENGINEERING METALLURGY. Especially adapted from Met. 21 for students taking the Curriculum in Chemical Engineering. Prerequisite: Chem. 1. First semester (2).

Met. 24. SHORT COURSE IN NON-FERROUS METALLURGY. Continuation of Met. 23. Second semester (2).

Met. 25. ELECTROCHEMISTRY AND ELECTROMETALLURGY. A combination of Met. 5 and 6. Prerequisite: Met. 21. First semester (2).

Met. 30. PHYSICAL METALLURGY. Physical structure and constitution of metals and alloys; effect thereon of mechanical working, heat treatment, composition, etc.; including polishing and examination of microsections and an introduction to metallography. Lectures and laboratory work. Prerequisites: Met. 1 and 2, or Met. 21 or 23. Fee, $5. Second semester (2).

Met. 33. METALLURGICAL LABORATORY. The internal structure of metals and industrial alloys; effect of cold rolling and annealing. Heat treatment of alloys and case-hardening of steels. Foundry experiments. Fatigue and corrosion testing of metals.

Electric arc welding. Use of instrumtnts and apparatus employed in metallurgical work, such as pyrometers, hardness testing machines, microscopes, gas and electric furnaces, etc. Must accompany or follow Met. 21 or 23. Fee, $5. First semester (1).

Met. 34. METALLURGICAL LABORATORY. Continuation of Met. 33. Fee, $5. Second semester (1).

Met. 35. ELECTROCHEMICAL LABORATORY. Quantitative relations in the deposition of metals by electrolysis. Experimental study of the conditions controlling the nature of electrolytic deposits, electrolysis of fused salts, cathodic and anodic reactions. Must accompany Met. 5. Fee, $5. First semester (1).

Met. 48. SUMMER WORK. At the end of the sophomore year, eight weeks' practical experience in industrial plants is required of students who do not take Chem. 39 or M.S.T. 9 or 19.

Met. 49. SUMMER WORK. At the end of the junior year students in the Curriculum in Metallurgical Engineering are required to secure in industrial plants at least eight weeks' practical experience.

Met. 61. PROBLEMS IN GENERAL METALLURGY. A course of problems embodying the use of physical, chemical, and mechanical principles as the basis of practical metallurgy. Data are taken, as far as possible, from actual practice, so that the results have an important bearing in the understanding of metallurgical processes. Must accompany Met. 1. Prerequisite: Chem. 8. Second semester (1).

Met. 62. PROBLEMS IN IRON AND STEEL METALLURGY. A course of problems involving the fundamental principles of the various processes in the metallurgy of iron and steel, to give the student an understanding of the quantitative relationships in the processes. Prerequisites: Met. 1 and 61. Must accompany Met. 2. First semester (1).

Met. 81. SHORT COURSE IN METALLURGICAL ENGINEERING PROBLEMS. An abridgment of Met. 61 and 62. Prerequisites: Chem. 1 or 3 and 8, and Phys. 2. Must accompany Met. 21. First or second semester (1).

Met. 83. SHORT COURSE IN METALLURGICAL ENGINEERING PROBLEMS. Same as Met. 81, but adapted for students taking the curriculum in Chemical Engineering. Prerequisites: Chem. 1

or 3 and 8, and Phys. 2. Must accompany Met. 23. First semester (1).

Met. 84. SHORT COURSE IN METALLURGICAL ENGINEERING PROBLEMS. An abridgment of Met. 63 and 64. Second semester (1).

For Advanced Undergraduates and Graduates

Met. 6. ELECTROMETALLURGY. Lectures discussing the practical application of electricity to metallurgical processes; electrothermics; electrolytic and electric furnace plants and practice. Prerequisites: Met. 1 and 5. Second semester (1).

Met. 31. METALLOGRAPHY. Continuation of Met. 30. Study of the structure of metals and alloys, particularly the important industrial alloys such as steel, cast iron, brass, duralumin, etc., with the microscope and other apparatus. The influence of thermal and mechanical treatment on properties and structure. Lectures and laboratory work. Prerequisites: Met. 1 and 2 or Met. 30. Fee, $5. First semester (2).

Met. 32. METALLURGICAL LABORATORY. Principles of process metallurgy, such as alloying, galvanizing, measurement of air volume and moisture content, desilverization of lead, cementation of steel, electrolysis, hydrometallurgy, heat transfer, heat conduction, and radiation. Principles of physical metallurgy, such as the effect of mechanical work and heat treatment, influence of impurities, etc. Calibration and use of instruments employed in metallurgical investigations, pyrometers, calorimeters, etc. Determination of efficiencies of furnaces. Experiments with electrochemical processes, electric furnaces, etc. Prerequisites: Met. 1, 2, 3, 5, 31 and 35. Fee, $15. Second semester (3).

Met. 39. SEMINAR. Conference hours of the staff of the department with students, to discuss current metallurgical literature, processes and problems; involving reading of current English and foreign literature and verbal presentation by the students. Training in the preparation and writing of engineering reports. Inspection visits to plants for smelting, refining, heat treating, rolling, forging, testing, carburizing, and founding of ferrous or non-ferrous metals and alloys; also to manufacturing plants where metals are used, adapted and applied. First semester (3).

Met. 40. SEMINAR. Continuation of Met. 39. Second semester (2).

Met. 63. PROBLEMS IN THE METALLURGY OF COPPER, LEAD, GOLD AND SILVER. A course of problems concerned with the principles utilized in the metallurgy of copper, lead, silver and gold. Prerequisite: Met. 61. Must accompany Met. 3. First semester (1).

Mat. 64. PROBLEMS IN THE METALLURGY OF ZINC, ALUMINIUM AND THE MINOR METALS. A course of problems concerned with the principles utilized in the metallurgy of zinc, aluminium, etc. Prerequisite: Met. 61. Must accompany Met. 4. Second semester (1).

For Graduates

Met. 101. METALLURGICAL INVESTIGATION AND THESIS. Study of the literature and investigation of some special metallurgical problems, such as: an improvement or innovation in some metallurgical process; the establishment of an equilibrium diagram of a series of alloys; the effect of heat treatment on a metal or alloy; or some other contribution to metallurgical knowledge, or else confirmation of knowledge not yet fully established. The study and investigation must be embodied in a written report. Prerequisites: Met. 2, 3 or 4. Both semesters (6). Professor Stoughton, or Assistant Professor Butts or Doan.

Met. 102. METALLURGICAL INVESTIGATION AND THESIS. Continuation of Met. 101. Both semesters (3). Professor Stoughton, or Assistant Professor Butts or Doan.

MILITARY SCIENCE AND TACTICS

MAJOR MC CAMMON, CAPTAINS CHANCE, CHALKER,
RODMAN AND HYDE, LIEUTENANT TABER,
SERGEANTS MORING, LAVIN AND NEWCOMB

Infantry Unit

An infantry unit of the Reserve Officers' Training Corps was established at Lehigh University in September, 1919. Conducted on a voluntary basis during the year 1919-1920, the unit had a membership of 313 students. A year later the

Trustees and Faculty of the University made the Basic Course, Military Science and Tactics, a required subject, under the R.O.T.C. regulations, for physically fit freshmen and sophomores. Provision for this trianing is made in their schedule of study.

The military courses contemplated under the War Department regulations consist of two years of basic work and two years of elective advanced work along specialized lines. Students who complete the four-year course become eligible for commissions as second lieutenants in the Infantry Officers' Reserve Corps.

Uniform and equipment are furnished by the Government; musical instruments are furnished to the members of the band. Each student to whom government property is issued is required to make a cash deposit of $25.00, which is refunded in full upon the return of the property in good condition; this deposit is payable at the time of registration for the first semester. During the advanced course students are paid commutation of subsistence, amounting to approximately $10.00 a month.

Mil. 1. Basic Course, Infantry, First Year. Fundamental military training common to all arms of the service. Theoretical and practical instruction in marksmanship, military courtesy, military hygiene and first-aid, physical drill, and command and leadership. Three hours a week. First semester (2).

Mil. 2. Basic Course, Infantry, First Year. Continuation of Mil. 1. Second semester (2).

Mil. 3. Basic Course, Infantry, Second Year. Fundamental military training common to all arms of the service. Theoretical and practical instruction in scouting and patrolling, musketry, interior guard duty, automatic rifle, and command and leadership. Students who indicate suitable proficiency in this course are appointed corporals in the R.O.T.C. Unit. Three hours a week. First semester (2).

Mil. 4. Basic Course, Infantry, Second Year. Continuation of Mil. 3. Second semester (2).

Mil. 5. Advanced Course, Infantry, First Year. Theoretical and practical instruction in military sketching, military field engineering, infantry weapons (machine gun), command and leadership, and tactical exercises. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. Unit. Five hours a week. First semester (3).

Mil. 6. ADVANCED COURSE. INFANTRY. First Year. Continuation of Mil. 5. Second semester (3).

Mil. 7. ADVANCED COURSE. INFANTRY. Second Year. Theoretical and practical instruction in infantry weapons (37 mm. gun and 3″ trench mortar), administration, military history and national defense act, combat principles, tactical exercises, map problems and war games, command and leadership, military law and rules of land warfare. Students who indicate suitable proficiency in this course are appointed commissioned officers in the R.O.T.C. Unit. Five hours a week. First semester (3).

Mil. 8. ADVANCED COURSE. INFANTRY, Second Year. Continuation of Mil. 7. Second semester (3).

Mil. 9. ADVANCED CAMP. INFANTRY. Compulsory for students who elect the advanced course. (3).

Ordnance Unit

An Ordnance Unit of the R.O.T.C. was established at this University in September, 1925. The course consists of the customary two years of basic training, and two years of advanced work in technical and military subjects. Students in the College of Engineering are eligible, preference being given to those in Mechanical, Chemical, Metallurgical and Electrical Engineering. Ordnance students receive the same allowance as do those of the Infantry Unit. Students completing the four-year course are eligible for commissions as second lieutenants in the Ordnance Officers' Reserve Corps.

Mil. 11. BASIC COURSE, ORDNANCE, First Year. Same as for Infantry. First semester (2).

Mil. 12. BASIC COURSE, ORDNANCE, First Year. Continuation of Mil. 11. Second semester (2).

Mil. 13. BASIC COURSE, ORDNANCE, Second Year. Same as for Infantry. First semester (2).

Mil. 14. BASIC COURSE, ORDNANCE, Second Year. Continuation of Mil. 13. Second semester (2).

Mil. 15. ADVANCED COURSE, ORDNANCE. First Year. Five hours a week, three hours of which is credited to technical courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: company administration, materiel (except ammunition and explosives), military law, military organization. Students who indicate suitable proficiency in this course are appointed sergeants in the R.O.T.C. Unit. First semester (1½).

Mil. 16. ADVANCED COURSE, ORDNANCE. First Year. Continuation of Mil. 15. Second semester (1½).

Mil. 17. ADVANCED COURSE, ORDNANCE. Second Year. Five hours a week, three hours of which is credited to technical courses in the regular engineering curricula. Two hours' instruction weekly is given in the following military subjects: Property accounting and ordnance financial procedure, ammunition and explosives, commercial law, procurement, storage and issue, elementary ordnance engineering. Students who indicate suitable proficiency in this course are appointed student commissioned officers, and upon graduation are appointed second lieutenants in the Ordnance Officers' Reserve Corps. First semester (1½).

Mil. 18. ADVANCED COURSE, ORDNANCE, Second Year. Continuation of Mil. 17. Second semester (1½).

Mil. 19. ADVANCED CAMP, ORDNANCE. Compulsory for students who elect the advanced course. (3).

A professional trip to the exhibition and annual meeting of the Army Ordnance Association at Aberdeen Proving Ground, Md., is made in October by students taking Mil. 15 and 17.

MINING ENGINEERING

PROFESSOR ECKFELDT, ASSISTANT PROFESSOR SINKINSON

Mine. 1. MINING ENGINEERING. *Prospecting:* Modes of occurrence of minerals; uses of geology; prospecting for placers, veins and beds; magnetic prospecting; drilling; sampling; valuation of property; location of claims; patenting mining ground. *Boring:* Uses of bore-holes; methods, by percussion and rotation; survey of bore-holes. *Transportation:* Haulage: surface and underground methods; ropes, motors and cars; aerial tramways; loading and unloading; storage of mineral;

transportation of workmen; mine tracks; signaling. Hoisting: motors, ropes, receptacles; safety appliances; systems of hoisting. First semester (3).

Mine. 2. MINING METHODS. *Exploitation:* Methods of working deposits; location of surface plant; rock-drilling, tools and machines; air compressors; use of explosives and blasting; safety regulations; quarrying. Tunneling, slope and shaft sinking. Timbering; support of excavations by wood, steel and concrete. Methods of mining; stripping; hydraulicking; dredging; room and pillar; longwall; stoping; filling; caving; top-splicing; robbing. Coal cutting machinery. First semester (3).

Mine. 3. ORE DRESSING AND LABORATORY. General principles and physical properties upon which the recovery of minerals from ores is based, followed by detailed study of machines and apparatus used for coarse and fine crushing; classifying and preparation for concentration; various methods of concentration, including gravity and magnetic methods, oil flotation, etc. Study of procedure followed for treatment of ores in typical concentrating plants; visits to mills; experimental work on ores, giving practical application of principles and processes covered. A well-equipped laboratory gives opportunity for individual as well as class operation of machines and apparatus. Fee, $5. First semester (3).

Mine. 4. COAL PREPARATION AND LABORATORY. General principles of concentration applied to the preparation of coal. Recitations and laboratory work. Visits to breakers and coal washeries. Fee, $5. First semester (3).

Mine. 5. MINING ENGINEERING. *Drainage:* Surface water, prevention of access; mine dams; tunnel drainage; mechanical drainage, water-hoisting, pumping, classes of pumps. *Ventilation:* Mine air; vitiation of air; natural and mechanical methods of ventilation; systems, multiple entry, splitting; ventilating machines, fans and bloweres; testing air; ventilation laws. *Lighting:* Methods in use, safety lamps, electric lighting; safety regulations. *First Aid:* Causes of accidents, means of prevention, rescue work; first aid to injured; hygiene of mines. *Railroad Construction:* earthwork, culverts, retaining walls, piling, tunnels, trestles, bridges, track-work; railroad structures. Second semester (3).

Mine. 6. MINE SURVEYING. Forms for keeping notes; surface surveys; determination of true meridian, latitude and time from observations on Polaris and Sun; connecting surface surveys with mine surveys through tunnels, slopes and shafts; calculation of notes; mine mapping; mine problems; practice in mine surveying. *Mine Railroads.* Preliminary and location surveys; theory of curves; railroad mapping; calculation of earthwork; curve and compensation problems; practice in railroad surveying. Prerequisite: C.E. 6. Second semester (3).

Mine. 7. CONSTRUCTION. The use of stone, brick, concrete, and wood as structural material for foundations, piling, dams, retaining walls, mine buildings, railroads, trestles, tipples, ore bins, etc. First semester (2).

Mine. 8. OIL FIELD PRACTICE. Distribution of petroleum and natural gas; valuation of oil lands. Location of wells; development-drilling and production methods. Transportation; storage; fires; avoidable waste and conservation of oil and gas resources. Refining methods; casing-head gasoline. Second semester (2).

Mine. 9. MINE ADMINISTRATION. Organization, employment of labor, management; principles of mining. Second semester (1).

Mine. 10. FUEL TECHNOLOGY. Economic, statistical, scientific aspects. Fuel resources. Analysis of fuels, including gas analysis. Calorimetry; pyrometry; radiometry. Classification of fuels. Colloidal fuels. First semester (2).

Mine. 11. FUEL TECHNOLOGY. Theoretical aspects and practice in the utilization of fuels, with the incidental methods of laboratory investigation. Chemical composition of fuels; carbonization at low and high temperatures; complete gasification of fuels, with laboratory practice. Second semester (2).

Mine. 20. SUMMER WORK. Industrial employment for eight weeks, following the junior year, with report.

For Graduates

Students desiring to do graduate work in Mining Engineering should consult with the Professor of Mining Engineering with regard to their qualifications.

Mine. 101. METHODS OF MINING. The study of methods used in a given mining region, or in the production of a given class of materials, with respect to conditions influencing choice of method and cost. First semester (5). Professor Eckfeldt.

Mine. 102. METHODS OF MINING. Continuation of Mine. 101. Second semester (5). Professor Eckfeldt.

Mine. 103. MINING PLANT. The determination of the efficiency of mining machinery of given types under varying conditions. First semester (5). Professor Eckfeldt.

Mine. 104. MINING PLANT. Continuation of Mine. 103. Second semester (5). Professor Eckfeldt.

Mine. 105. ORE-DRESSING AND COAL WASHING PLANT. The study of certain operations incident to the dressing of ores or the preparation of coal. Determination of efficiency of machines and processes. Losses in dressing. First semester (5). Assistant Professor Sinkinson.

Mine. 106. ORE-DRESSING AND COAL WASHING PLANT. Continuation of Mine 105. Second semester (5). Assistant Professor Sinkinson.

Mine. 107. FUEL TECHNOLOGY RESEARCH. Physical and chemical investigations of coals and fuel oils; gas analysis; ignition phenomena; mechanism of combustion; surface combustion; heat recuperation. General study of methods employed in carbonizing coal between 500° and 1200° C., including recovery of byproducts; coal-gas and coking industries. First semester (4). Assistant Professor Sinkinson.

Mine. 108. FUEL TECHNOLOGY RESEARCH. Continuation of 107. Second semester (4). Assistant Professor Sinkinson.

PORTUGUESE

See Romance Languages

PHILOSOPHY, PSYCHOLOGY AND EDUCATION

PROFESSOR HUGHES,
ASSISTANT PROFESSORS DROWN,* PICARD AND CROW,
MESSRS. MEENES, BECKER AND BLODGETT,
DRS. HOFFMAN AND KLOPP (LECTURERS)

PHILOSOPHY

Phil. 1. HISTORY OF PHILOSOPHY, ANCIENT AND MEDIAEVAL. A careful study of Plato's *Republic* and other source-material.

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* Absent on leave 1927-1928.

Lectures on the philosophy of the Middle Ages. Discussions and recitations. First semester (3).

Phil. 2. HISTORY OF PHILOSOPHY, MODERN. A study of modern philosophical thought through selected readings. Discussions and lectures. Second semester (3).

Phil. 3. INTRODUCTION TO PHILOSOPHY. A study of the universe as suggested by the conclusions and implications of the physical, biological and social sciences. For sophomores, juniors and seniors. First semester (3).

Phil. 4a. MAN THINKING. A course dealing with such processes as (a) defining, classifying, implication; (b) narration and explanation; (c) discovery and invention; (d) study and learning; (e) evaluating. First semester (3).

Phil. 4b. MAN AND THE COSMOS. (a) The astro-physical universe, natural law; (b) change, evolution, time, history; (c) the bases of society and the impulse to the arts; (d) tradition and education. Second semester (3).

Phil. 5. PHILOSOPHY OF RELIGION. After a brief psychological introduction, the main problems of the philosophy of religion discussed through the medium of assigned reports. First semester (1).

Phil. 6. PHILOSOPHY OF RELIGION. A study of important teachings of the world religions from the standpoint of philosophy. Second semester. (1).

Phil. 11. ETHICS. A study of ethical viewpoints approached through discussion. First semester (1).

Phil. 12. ETHICS. Practical problems of conduct. Discussions. Second semester (1).

Phil. 14. LOGIC AND SCIENTIFIC METHOD. Formal logic. The history of scientific method. Discussions. Second semester (3).

READING IN PHILOSOPHY. In accordance with the announcement on page 39, qualified students may pursue a course of reading in philosophy in connection with the major study in Philosophy. Professor Hughes, Dr. Picard and Mr. Becker act as a committee in charge of this work.

For Advanced Undergraduates and Graduates

Phil. 7. SEMINAR IN PHILOSOPHY. Each year a topic will be chosen, upon which the professor will present a course of lectures. Each student will select a division of this general topic for his study and report, and will present a paper upon that topic and pass an examination in the subject of the seminar. Prerequisites: two of the following courses: Phil. 1, 2, 3, 4a or 14. First semester (3).

Phil. 8. SEMINAR IN PHILOSOPHY. This is conducted similarly to Phil. 7. Second semester (3).

For Graduates

Prerequisite to major graduate work in Philosophy: at least three undergraduate courses in Philosophy or Psychology.

Phil. 101. HISTORY OF PHILOSOPHY: ANCIENT AND MEDIAEVAL. Rise of the Hellenic schools of philosophy, the effect of Greek philosophy upon Christian doctrine; Scholasticism and the Schoolmen. First semester (3). Professor Hughes.

Phil. 102. HISTORY OF PHILOSOPHY: MODERN. The emphasis is placed upon Hobbes, Spinoza, Leibnitz and Locke; upon Kant and Hegel; and upon Bergson and James. Second semester (3). Professor Hughes.

Phil. 103. PRE-SOCRATIC PHILOSOPHY. A detailed study of the extant writings of the early Greek philosophers from Thales to Democritus, together with a survey of the theories of the development of pre-Socratic philosophy. Special emphasis on the transition from mythological to philosophical explanations, and on primitive influences. A knowledge of elementary Greek is prerequisite. Given in 1928-1929. First semester (3). Assistant Professor Picard.

Phil. 105. PLATO. Discussion will deal chiefly with the points raised by Paul Elmer More in his four treatises upon Plato's work and influence. Prerequisites: Phil. 1, and 2, 3, 4a or 14, Given in 1928-1929. First semester (3). Professor Hughes.

Phil. 106. SPINOZA. The *Emendation* and the *Ethics*. Discussion will largely relate to current "philosophies of science." Prerequisites: Phil. 1, and 2, 3, 4a or 14. Given in 1928-1929. Second semester (3). Professor Hughes.

Phil. 107. PHILOSOPHY OF VALUE. A survey of current theories of the nature of value, with an attempt to reach a solution of outstanding problems. The course will include the study of the theories of Rickert, Windelband, Meinong, Münsterberg, Cassirer, Urban, Bosanquet, Dewey and Perry. Given in 1928-1929. Second semester (3). Assistant Professor Picard.

Phil. 108. THESIS IN PHILOSOPHY. First semester (2) or (3). Professor Hughes, Assistant Professor Picard.

Phil. 109. THESIS IN PHILOSOPHY. Second semester (2) or (3). Professor Hughes, Assistant Professor Picard.

PSYCHOLOGY

Psych. 1. GENERAL PSYCHOLOGY. For B.A. students. The normal and the abnormal in personal life; phases of attention; psychological methods illustrated; a survey of the scope and task of psychology. First semester (3).

Psych. 2. EDUCATIONAL PSYCHOLOGY. The educative process; analysis of mental traits; learning and teaching; transfer of training. Prerequisite: Psych. 1. Second semester (3).

Psych. 4. SOCIAL PSYCHOLOGY. The bases of sport, art, religion, and of the impulse to scientific discovery; heredity and environment; the social and moral aspects of personality. Prerequisite: Psych. 1. Second semester (3).

Psych. 5. INTRODUCTION TO PSYCHOLOGY. A course intended primarily for students in engineering. The general conception of a life-career; the relation of industrial conditions to personal life. First semester (3), or second semester (3).

Psych. 6. ABNORMAL PSYCHOLOGY. Primarily for seniors in the premedical curriculum. Mental disorders and mental hygiene: the psychology of the emotions and of temperament. Reading, discussions and a series of clinics at the State Hospital. Prerequisite: Psych. 1. Second semester (3).

Psych. 10. PRINCIPLES OF PSYCHOLOGY. For B.S. students. The several methods by which personal life is submitted to analysis, estimate and control. The picture of the normal life-career, and a summary of the factors that determine its success or failure. The task and scope of psychology. First semester (3).

Psych. 11. SEMINAR. For seniors who wish to conduct individual studies in some field of psychological experiment. Prerequisite: six hours in Psychology. First semester (3).

Psych. 12. SEMINAR. A course similar to Psych. 11. Prerequisite: six hours in psychology. Second semester (3).

Psych. 15. PSYCHOLOGY APPLIED TO BUSINESS AND INDUSTRY. Work and fatigue; motivation; problems of personnel, and of training; psychological factors in display and persuasion; factors that reduce efficiency. For B.S. students. Prerequisite: Psych. 1 or 10 or 5. Second semester (3).

Psych. 16. PSYCHOLOGY APPLIED TO BUSINESS AND INDUSTRY. A course similar to Psych. 15, but offered in the first semester, and especially for students in engineering who have had Psych. 5. First semester (3).

READING AND INVESTIGATION IN PSYCHOLOGY. In accordance with the announcement on page 39, qualified students may pursue a course of reading in psychology, which will include the investigation of some problem, either through experiment or otherwise. Professor Hughes, Dr. Meenes and Dr. Blodgett act as a committee in charge of this work.

For Advanced Undergraduates and Graduates

Psych. 3. EDUCATIONAL PSYCHOLOGY, ADVANCED. Practice in administering individual and group tests: study of administrative applications and of classical investigations, with some first-hand investigation or experiment. Prerequisite: Psych. 2 or 4 or 15. First or second semester (3).

Psych. 13. CLINICAL PSYCHOLOGY. A study of exceptional children and of psychopathological symptoms and personalities. Practice in the use of mental tests of many kinds. Prerequisite: six hours in Psychology. First semester (2) or (3).

For Graduates

Evidence of the satisfactory completion of at least three undergraduate courses in Psychology will be demanded of students who wish to do their major graduate work in Psychology.

Psych. 102. PSYCHOLOGICAL TESTS AND MEASUREMENTS. The theory of these tests is studied historically, and also in the effort to formulate and work out new tests. In addition the personnel problem presented by a specific situation, either in a school or in a business firm, is made a matter of detailed investigation. Second semester (2) or (3). Professor Hughes, Dr. Meenes.

Psych. 103. SEMINAR AND THESIS IN PSYCHOLOGY. First semester (2) or (3). Professor Hughes, Dr. Meenes, Dr. Blodgett.

Psych. 104. SEMINAR AND THESIS IN PSYCHOLOGY. Second semester (2) or (3). Professor Hughes, Dr. Meenes, Dr. Blodgett.

Psych. 105. EXPERIMENTAL PSYCHOLOGY OF PERCEPTION. Experimentation in the fields of spatial and temporal relations and of the various sense modalities. Special attention to the work of configurational psychologists. First semester (3). Dr. Meenes.

Psych. 106. EXPERIMENTAL PSYCHOLOGY OF PERCEPTION. Continuation of Psych. 105. Second semester (3). Dr. Meenes.

Psych. 107. INTRODUCTION TO RESEARCH IN COMPARATIVE PSYCHOLOGY. The evolution of the nervous system in its relation to animal behavior. Each student will deal experimentally with a problem. First semester (3). Dr. Blodgett.

Psych. 108. INTRODUCTION TO RESEARCH IN COMPARATIVE PSYCHOLOGY. Continuation of Psych. 107. Second semester (3).

Psych. 109. SYSTEMATIC PSYCHOLOGY. The several methods and programs of current psychology in their relation to each other and to the essential purposes of the science. An historical and theoretical study. First semester (3). Professor Hughes.

Psych. 110. SYSTEMATIC PSYCHOLOGY. Continuation of Psych. 109. Second semester (3). Professor Hughes.

EDUCATION

See also statement concerning preparation for teaching, in description of the College of Arts and Science.

Educ. 1. INTRODUCTION TO TEACHING. Adjusting pupils' school and social interests; introduction of pupil to effective methods of study; subject matter and method related to technique and routine. First semester (3).

Educ. 2. HISTORY OF EDUCATION. The advance of civilization and culture and the parallel progress of educational theory and practice. (1) Evolution of subject matter. (2) Evolution of educational institutions. (3) Educational leaders. Second semester (3).

Educ. 7. PRINCIPLES OF HIGH SCHOOL TEACHING. Character and qualifications essential to the high school teacher; the character of the high school student; types of class exercises; essential factors and devices: lesson-planning and assignment; the library and source material; problems and projects; exercises in lesson planning, readings and observations. First semester (3).

Educ. 8. THE POLITICAL ASPECT OF SCHOOL SYSTEMS. State and local school systems; political and administrative principles which guide State control of educational agencies. Prerequisite: Educ. 2 or 7. Second semester (3).

Educ. 10. SUPERVISION OF TEACHING AND SCHOOL MANAGEMENT. Organization and routine of school and classroom; management, discipline, supplies, forms, reports, marking, grading, testing, promotion, the external aspects of teaching. Prerequisite: Educ. 7. Given in 1928-1929. Second semester (3).

Educ. 11. PROBLEMS OF SECONDARY EDUCATION. The social background of American secondary education; aims, values and functions; analysis of each of the secondary subjects. Problems arising out of adolescence; out of individual differences; out of economic and social conditions; programs of studies; administrative problems; extra-curricular activities; the teaching staff; the plant and its equipment; cost and finance. Prerequisites: Educ. 1, and 7 or 10. First semester (3).

Educ. 15. PRACTICE TEACHING. This work is for the most part carried on in the Bethlehem High School. (1) Observation and report with conference; (2) participation in the routine work of the class, conduct of study periods and correcting papers; (3) actual conduct of class, careful study of lesson plans, followed by systematic criticism by the assisting teacher and by the professors of the department. Prerequisite: a course in Education. First semester (3).

Educ. 16. PRACTICE TEACHING. Continuation of Educ. 15. Second semester (3).

For courses in special methods see Lat. 9 and 10, Ger. 21, Fr. 93 and 94, P.E. 21 and 27, Phys. 31. For Educational Psychology, see Psych. 2 and 3.

For Advanced Undergraduates and Graduates

Educ. 9. PRINCIPLES OF EDUCATION. The theory of education based upon socially determined aims and values, upon biological and psychological factors in the pupil, and upon institutional processes. Summer session (3).

Educ. 14. CONTEMPORANEOUS EDUCATION. Readings in current educational literature which explain and indicate trends in the philosophy and practice of education. Second semester (3).

For Graduates

At least three semester courses in Education are prerequisite for a graduate major in this field. The prerequisites may be taken concurrently with a partial major program. Attention is called to Educ. 9 and 14 and to Psych. 3, 13 and 14, all of which are open to seniors and graduate students, and which may be accepted towards a major or minor in Education.

Educ. 101. SCHOOL ADMINISTRATION. State and local systems. How the State organizes its Department of Education, sets up professional standards and initiates educational programs; how it delegates power in education to subordinate units, and controls county and city districts; how it controls other educational institutions; the home and industry as they supplement education or compete with it. Given in 1928-1929. First semester (2). Assistant Professor Drown.

Educ. 102. SCHOOL ADMINISTRATION. City school systems. The school district and the municipality; organization, function and personnel of the school board and the administrative and teaching staffs; financial problems of the system; the organization of the teaching program, secondary education, elementary education, vocational and special education, programs and courses of study; supervision, general and special. Given in 1928-1929. Second semester (2). Assistant Professor Drown.

Educ. 103. SECONDARY EDUCATION. Renaissance and Reformation influences in secondary education; characteristic types of secondary schools in the United States; problems of adolescence and the secondary schools; secondary school aims and the American social structure. First semester (2). Assistant Professor Drown.

Educ. 104. SECONDARY EDUCATION. Continuation of Educ. 103. Secondary school subjects analyzed for their educational values; curriculum problems; administrative problems. Second semester (2). Assistant Professor Drown.

Educ. 105. JUNIOR HIGH SCHOOL. Articulation of secondary and elementary schools; administrative reforms, curriculum reforms. Summer session (3). Assistant Professor Drown.

Educ. 107. EDUCATIONAL MEASUREMENTS. Examination of the best tests, scales and score cards for their diagnostic and supervisory values; simpler statistics of agreement and variability needed in the use and interpretation of the tests. Given in 1928-1929. First semester (2). Assistant Professor Drown.

Educ. 108. ADVANCED EDUCATIONAL MEASUREMENTS. Use of tests in supervisory programs and surveys; construction and calibration of tests; advanced educational statistics; tables, charts and graphic methods. Given in 1928-1929. Second semester (2). Assistant Professor Drown.

Educ. 111. HISTORY OF EDUCATION, ADVANCED COURSE. The comparison of past practice and theory with present tendencies is the essential theme or method of this course. Summer session (3). Assistant Professor Drown.

Educ. 112. CURRICULUM MAKING. The nature of the curriculum. Values as determined by social factors, by individual capacities, by logical structure of subject matter, by methods and routine. Examination of typical curricula, old and new. Second semester (2). Assistant Professor Drown.

Educ. 115. SEMINAR AND THESIS IN EDUCATION. Organization of individual studies and investigation about some central topic. First semester (2) or (3). Professor Hughes, Assistant Professor Drown.

Educ. 116. SEMINAR AND THESIS IN EDUCATION. Conducted similarly to Educ. 115. Second semester (2) or (3). Professor Hughes, Assistant Professor Drown.

PHYSICAL EDUCATION

PROFESSOR REITER, ASSISTANT PROFESSOR BARTLETT,
MESSRS. KANALY AND MAHONEY

The aim of the Department of Physical Education is to insure the health and physical development of every student of the University. Facilities for accomplishing this aim are afforded in Taylor Gymnasium, the field house, the two playing levels of Taylor Field and Lehigh Field.

Each student, upon entering the University, is given a physical examination. He is advised as to postural and physical defects.

All students are required to take regular exercise under Department supervision. This requirement calls for two hours a week in the gymnasium, or participation, under the oversight of the Director, in one of the following organized sports: football, cross country running, basketball, wrestling, swimming, soccer, track, lacrosse, tennis, and baseball. In addition numerous intramural contests are held. All students are urged and encouraged to participate in these activities. Members of the R.O.T.C. unit may substitute one hour of military drill for one of the two hours of required gymnasium.

P.E. 1. PHYSICAL EDUCATION. Class exercise in the open air, consisting of setting-up work for correct carriage. Work with dumb bells, wands, and Indian clubs to stimulate circulation, respiration, and muscular action and to produce co-ordination and grace. Squad work on the heavy apparatus to develop strength in the larger muscles, recreative work in games and competitive exercises to develop the play and combative elements. The various drills and athletic dances are accompanied by music. Instruction in boxing, wrestling, swimming, fencing, golf, and personal defense. Corrective gymnastics are also given to those who have physical defects. The swimming course includes the various swimming strokes, fancy diving, and modern methods of life saving. A competent instructor is in charge. The measure of proficiency required of every student is swimming at least the length of the pool. Voluntary classes in advanced apparatus work. Talks to the freshmen on personal hygiene and the physiology of exercise. Freshman first semester.

P.E. 2. Physical Education.	Freshman second semester.
P.E. 3. Physical Education.	Sophomore first semester.
P.E. 4. Physical Education.	Sophomore second semester.
P.E. 5. Physical Education.	Junior first semester.
P.E. 6. Physical Education.	Junior second semester.
P.E. 7. Physical Education.	Senior first semester.
P.E. 8. Physical Education.	Senior second semester.

For Juniors and Seniors

The following courses are open only to juniors and seniors preparing themselves for professional careers in teaching and athletic coaching.

P.E. 22. Theory and Practice of Football. (1) Preliminaries: Equipment, conditioning, passing in its various forms, blocking, tackling, following and falling on the ball, punting, drop-kicking, place and goal kicking, methods of warding off and eluding the tacklers. (2) Offense: the advantages and disadvantages of the "huddle system" vs. the old system of signals. The various systems of plays among the colleges. (3) Defense: the various systems in use and their application in the different zones of the field. The strategy of meeting open, closed, and kick formations. Defense for forward passes, kicks, etc. Team play, field tactics, coaching systems, individual positions, the coach and his personality, and the development of personality in players. The place of scouting, planning the practice periods, play work, and fatigue. Special stress upon sportsmanship, ethical and educational factors relating to the game; considerable time spent on first aid and treatment of injuries, training, and personal hygiene. Throughout the course the discussion and interpretation of the rules. Text books and discussion. Three exercises in class room, one hour practical demonstration. Text book reading and discussion. Second semester (3).

P.E. 23. The Organization and Administration of Physical Education: Theory. A brief history of physical education. The theory of teaching, purpose and methods of instruction. Williams' *Organization of Physical Education.* Outside reading required. Second semester (2).

P.E. 24. The Organization and Administration of Physical Education: Practice. Calisthenics: theory and practice of teaching; freehand, dumb-bell, wand, and Indian-club exercises. Apparatus: Theory and practice of exercise on bars, rings, mats, bucks, horses, parallel bars, etc. Mass physical activities: participation and direction of mass games, athletics, and combative contests. Dancing, athletic and folk: elementary dance steps and simple folk games. Individual gymnastics: theory and practice of exercises for the correction of physical defects; exercises for faulty posture. Three hours practice per week. Second semester (1).

PHYSICS

PROFESSOR BIDWELL, ASSOCIATE PROFESSOR BAYLEY,
ASSISTANT PROFESSORS MARTIN, CARWILE, HANSON AND PETERSEN,
MESSRS. CRAFTS, WEBB, KARBLER, PALMER, BENDER, CLARK,
PARDUE, COUCH, FRIEND, SCOTT, SETTE AND SPROULL

Phys. 1. General Physics. Mechanics, Sound and Heat. Lecture demonstrations and recitations. Prerequisite: Math. 1 or its equivalent. First semester (3).

Phys. 1a. Physics Laboratory. Fee, $6. First semester (1).

Phys. 2. General Physics. Electricity, Magnetism and Light. Lecture demonstrations and recitations. Second semester (3).

Phys. 3. Physics Laboratory. Fee, $6. Second semester (1).

Phys. 4. Mechanics, Heat and Light. Lecture demonstrations and recitations. Prerequisites: Phys. 1 and 2. First semester (3).

Phys. 5. Physics Laboratory. Mechanics, Heat and Light. Prerequisites: Phys. 1, 1a, 2 and 3. Fee, $6. First semester (1).

Phys. 6. Elecricity, Magnetism and Sound. Lecture demonstrations and recitations. Prerequisites: Phys. 1 and 2. Second semester (3).

Phys. 7. Physics Laboratory. Electricity, Magnetism and Sound. Prerequisites: Phys. 1, 1a, 2 and 3. Fee, $6. Second semester (1).

Phys. 8. INTRODUCTION TO THE MATHEMATICAL THEORY OF ELECTRICITY AND MAGNETISM. Lectures and recitations. Electromagnetism, induced electromotive force and inductance, magnetic properties of iron, electric charge and condensers, electric field, potential, introduction to electron theory and thermionic emission. Prerequisites: Phys. 1, 2, 4, 6 and Math. 5. First semester (2).

Phys. 10. ELECTRICAL LABORATORY. Precise Measurements. Prerequisites: Phys. 1a, 3, 5 and 7. Fee, $6. First or second semester (1).

Phys. 11. ELECTRICAL LABORATORY. Precise Measurements. Continuation of Phys. 10. Prerequisites: Phys. 10. Fee, $6. Second semester (1).

Phys. 12. ELEMENTARY PHYSICS. A brief course for students in the Colleges of Arts and Sciences and Business Administration. Lecture demonstrations, recitations and laboratory. Fee, $6. First semester (3).

Phys. 13. ELEMENTARY PHYSICS. Continuation of Phys. 12. Prerequisite: Phys. 12. Fee, $6. Second semester (3).

Phys. 14. SPECIAL TOPICS IN CLASSICAL PHYSICS. Recitations and laboratory. Prerequisites: Math. 1, 2 or 3 and Phys. 13. Fee, $6. First semester (3).

Phys. 15. MODERN PHYSICS. A non-mathematical introduction to the theories of contemporary physics. Lecture demonstrations and recitations. Prerequisite: Phys. 13 or its equivalent. Second semester (3).

Phys. 30. PHOTOMETRY AND ILLUMINATION. Lectures and recitations. Illumination standards, measurements of light and illumination, laboratory methods and devices, commercial methods, practical installations. Prerequisites: Phys. 1 and 2. First semester (1).

Phys. 31. TEACHING OF PHYSICS IN SECONDARY SCHOOLS. Principles of scientific methods, study of class room practices in neighboring schools, text-books and methods. First semester (2).

Phys. 50. Following the junior year, students in the curriculum in Engineering Physics are required to spend at least eight weeks in industrial employment and a written report is required.

For Advanced Undergraduates and Graduates

Phys. 16. INTRODUCTION TO THEORETICAL PHYSICS. Mechanics, thermodynamics, the kinetic theory of gases, the wave theory of light, and the mathematical theory of electricity and magnetism. Prerequisites: Math. 5, Phys. 4 and 6. First semester (2).

Phys. 17. INTRODUCTION TO THEORETICAL PHYSICS. Continuation of Phys. 16. Prerequisite: Phys. 16. Second semester (3).

Phys. 18. ADVANCED LABORATORY PRACTICE. A laboratory course of advanced character. The experiments in general are designed to encourage originality on the part of the student. Prerequisites: Math. 5 and Phys. 7 or its equivalent. Fee, $6. First or second semester (1).

Phys. 19. ADVANCED LABORATORY PRACTICE. Continuation of Phys. 18. Prerequisite: Phys. 18. Fee, $6. First or second semester (2).

Phys. 20. ELECTRIC OSCILLATIONS AND ELECTRIC WAVES. The theory of electric oscillations, electric waves and high frequency phenomena. Prerequisites: Phys. 8 and Math. 6. First semester (3).

Phys. 21. LABORATORY PHYSICS. A laboratory course concurrent with Phys. 20. Fee, $6. First semester (1).

Phys. 22. PHYSICAL OPTICS AND SPECTROSCOPY. Elementary treatment of the wave theory of light, interference, diffraction, polarization, etc. Exposition of some phases of spectroscopic phenomena. Prerequisites: Phys. 4 and 6. First semester (3).

Phys. 23. LABORATORY PHYSICS. A course concurrent with Phys. 22. Prerequisite: Phys. 7. Fee, $6. First semester (1).

Phys. 24. ELECTRIC DISCHARGE THROUGH GASES. The properties of gaseous ions, the experimental data leading to the electron theory, including a study of vacuum tube phenomena, ionization and resonance potential, photo-electricity, etc. Prerequisites: Phys. 8, and Phys. 15 or Chem. 7. Second semester (2).

Phys. 25. LABORATORY PHYSICS. A course concurrent with Phys. 24. Prerequisites: Phys. 18 and 19. Fee, $6. Second semester (1).

Phys. 26. HEAT. Temperature measurements, heat transfer and pyrometry. Prerequisites: Phys. 16 and 17. Second semester (3).

Phys. 27. LABORATORY PHYSICS. A course concurrent with Phys. 26. Prerequisites: Phys. 18 and 19. Fee, $6. Second semester (1).

For Graduates

Phys. 100. HEAT AND THERMODYNAMICS. Mathematical treatment of radiation and absorption; conduction; first and second laws of thermodynamics; entropy; thermodynamic potential. Prerequisites: Phys. 16 and 17, or their equivalent, and Math. 11 and 12. Second semester (3). Professor Bidwell.

Phys. 102. THEORY OF ELECTRICITY AND MAGNETISM. An introductory discussion of the theorems in Electrostatics of Gauss, Poisson, Laplace and their application. Maxwell's theory of the electromagnetic field and electromagnetic waves followed by the electron theory of Lorenz as applied to electricity and magnetism. Prerequisites: Phys. 16 and 17, or their equivalent, and Math. 11 and 12. First semester (3). Associate Professor Bayley.

Phys. 103. THEORY OF ELECTRICITY AND MAGNETISM. Continuation of Phys. 102. Second semester (3). Associate Professor Bayley.

Phys. 104. THEORY OF LIGHT. Mathematical treatment of the wave theory of light; interference; diffraction; polarization, etc. Prerequisites: Phys. 22, or its equivalenet, and Math. 11 and 12. First semester (3). Associate Professor Bayley.

Phys. 105. THEORY OF LIGHT. Continuation of Phys. 104. Prerequisite: Phys. 104. Second semester (3). Associate Professor Bayley.

Phys. 106. ELECTRON THEORY AND ATOMIC STRUCTURE. A study of the properties of the electron; wave and quantum theories of radiation and the structure of the atom. Prerequisites: Phys. 24, or its equivalent, and Math. 11 and 12. Second semester (3). Assistant Professor Petersen.

Phys. 108. ADVANCED MECHANICS. Principles of statics and dynamics. Lagrange's equation with application to particles and rigid bodies, and the theory of oscillation. Prerequisites:

Phys. 16 and 17 and Math. 11 and 12. First semester (3). Assistant Professor Hanson.

Phys. 110. Kinetic Theory of Gases. The law of distribution of velocities. Boltzmann's and Maxwell's Theories; viscosity, diffusion, etc. Prerequisites: Phys. 16 and 17, or their equivalent, and Math. 11 and 12. First semester (3). Professor Bidwell.

Phys. 111. Physics Seminar. Reports on research and current literature. First semester (1). Professor Bidwell.

Phys. 112. Physics Seminar. Continuation of Phys. 111. Second semester (1). Professor Bidwell.

PSYCHOLOGY

See Philosophy, Psychology and Education

ROMANCE LANGUAGES

PROFESSOR FOX, ASSISTANT PROFESSORS TOOHY,*
H. C. BROWN AND VANCE,
MESSRS. SOTO, SCOTT, THOMPSON AND TURK

FRENCH

Fr. 1. Elementary French. Drill in speaking and writing. Primarily for freshmen with less than two units of entrance French. First semester (3).

Fr. 2. Elementary French. Continuation of Fr. 1. Second semester (3).

Fr. 3. Elementary French. The same as Fr. 1, except that this course is given entirely in English. Primarily for freshmen with less than two units of entrance French. First semester (3).

Fr. 4. Elementary French. Continuation of Fr. 3. Second semester (3).

Fr. 5. Elementary French. Drill in speaking and writing. primarily for upperclassmen who have shown ability in the use of other languages. First semester (3).

Fr. 6. Elementary French. Continuation of Fr. 5. Second semester (3).

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* Absent on leave 1927-1928.

Fr. 11. Intermediate French. Continuation of Fr. 2. Prerequisites: Fr. 1 and 2. First semester (3).

Fr. 12. Intermediate French. Continuation of Fr. 11. Second semester (3).

Fr. 13. Intermediate French. Continuation of Fr. 4. Prerequisites: Fr. 3 and 4. First semester (3).

Fr. 14. Intermediate French. Continuation of Fr. 13. Second semester (3).

Fr. 17. Intermediate French. Prose and poetry. Balzac, Flaubert, Daudet, Moliere, Corneille, Racine. Society in the seventeenth century. Drill in speaking and writing. Primarily for students in Arts and Science and Business Administration who have had two years of entrance French. First semester (3).

Fr. 18. Intermediate French. Continuation of Fr. 17. Second semester (3).

Fr. 19. Intermediate French. The same as Fr. 17 except in the nature of the outside reading. Primarily for students in Arts and Science and Business Administration who have had two years of entrance French. First semester (3).

Fr. 20. Intermediate French. Continuation of Fr. 19. Second semester (3).

Fr. 27. French Literature in the Seventeenth and Eighteenth Centuries. Continuation of Fr. 18. Continued drill in the use of the spoken language. Prerequisite: Fr. 17. First semester (3).

Fr. 28. French Literature in the Seventeenth and Eighteenth Centuries. Continuation of Fr. 27. Prerequisite: Fr. 17. Second semester (3).

Fr. 29. French Literature in the Seventeenth and Eighteenth Centuries. The same as Fr. 27 except in the nature of the outside reading. Prerequisite: Fr. 19. First semester (3).

Fr. 30. French Literature in the Seventeenth and Eighteenth Centuries. Continuation of Fr. 29. Prerequisite: Fr. 19. Second semester (3).

Fr. 31. French Literature in the Nineteenth Century. Prerequisite: Fr. 27 or 29. First semester (3).

Fr. 32. FRENCH LITERATURE IN THE NINETEENTH CENTURY. Prerequisite: Fr. 27 or 29. Second semester (3).

Fr. 33. CONTEMPORARY FRENCH LITERATURE. Prerequisite: Fr. 27 or 29. First semester (3).

Fr. 34. CONTEMPORARY FRENCH LITERATURE. Continuation of Fr. 33. Prerequisite: Fr. 27 or 29. Second semester (3).

Fr. 37. HISTORIC FORCES. Rapid reading of modern French authors as a basis for the study of the rise and development of certain social and political influences in the French nation. Themes and discussions. Prerequisite: Fr. 27. First semester (3).

Fr. 38. HISTORIC FORCES. Continuation of Fr. 37. Prerequisite: Fr. 27. Second semester (3).

Fr. 39. HISTORIC FORCES. Same as Fr. 37 except that this course is given entirely in English. Prerequisite: Fr. 29. First semester (3).

Fr. 40. HISTORIC FORCES. Continuation of Fr. 39. Prerequisite: Fr. 29. Second semester (3).

Fr. 91. FRENCH ORAL COMPOSITION. A course in the oral and written use of modern French prose. To be taken in conjunction with Fr. 93 by those students who do not take Fr. 95. Prerequisite: permission of the instructor in charge of the course. First semester (1).

Fr. 92. FRENCH ORAL COMPOSITION. Continuation of Fr. 91. To be taken in conjunction with Fr. 94 by those students who do not take 96. Prerequisite: permission of the instructor in charge of the course. Second semester (1).

Fr. 93. FRENCH ORAL COMPOSITION. A course for students who wish a greater opportunity to practice in the oral and written use of modern French prose. Specially recommended for those who expect to teach French. Prerequisite: permission of instructor in charge of the course. First semester (2).

Fr. 94. FRENCH ORAL COMPOSITION. Continuation of Fr. 93. Second semester (2).

Fr. 95. TEXTS AND METHODS. This course may be taken profitably in conjunction with Fr. 93. Prerequisite: permission of instructor in charge of the course. First semester (1).

Fr. 96. TEXT AND METHOD. Continuation of Fr. 95. Second semester (1).

For Advanced Undergraduates and Graduates

Fr. 41. French Literary History. General review of French literature. Reading, lectures and explanation of texts. Prerequisite: Fr. 27 or 29. Given in 1928-1929. First semester (3).

Fr. 42. French Literary History. Continuation of Fr. 41. Prerequisite: Fr. 27. Second semester (3).

Fr. 45. Seminar. A study of the works of some author or group of authors or of a period. Prerequisite: Fr. 27 or 29. First semester (3).

Fr. 46. Seminar. Continuation of Fr. 45. Prerequisite: Fr. 27 or 29. Second semester (3).

Fr. 47. French Influences beyond the Confines of Historic France. Colonial possessions, mandates and international relations. Prerequisite: Fr. 27. Given in 1928-1929. First semester (3).

Fr. 48. French Influences beyond the Confines of Historic France. Continuation of Fr. 47. Prerequisite: Fr. 27. Second semester (3).

Fr. 51. French Literature in the Sixteenth Century and Earlier. Prose and poetry. Rebelais, Montaigne, Marot, Villon, Froissart, Commynes. Prerequisite: Fr. 29. Not given in 1928-1929. First semester (3).

Fr. 52. French Literature in the Sixteenth Century and Earlier. Continuation of Fr. 51. Prerequisite: Fr. 29. Second semester (3).

For Graduates

Prerequisites: Graduate students who major in French must have completed not less than twelve semester hours of French language and literature above the standard intermediate courses. A reading knowledge of Latin and German is desirable; a general knowledge of English literature is required.

Fr. 101. Old French. Grammar, Schwan-Behrens. Earlier texts. *Chanson de Roland.* Given in 1928-1929. First semester (3). Assistant Professor Toohy.

Fr. 102. Old French. Continuation of Fr. 101. Second semester (3). Assistant Professor Toohy.

Fr. 151. The Realistic Novel in France. Novels of Flaubert, Balzac, the de Goncourts, de Maupassant, Daudet, Zola, Mérimée. Reading and written reports on all books read. Lectures and discussion of the origin and development of the novel in France. The theory of realism and naturalism. Given in 1928-1929. First semester (3). Assistant Professor Toohy.

Fr. 152. THE REALISTIC NOVEL IN FRANCE. Continuation of Fr. 151. Second semester (3). Assistant Professor Toohy.

Fr. 155. FRENCH SOCIAL FORCES. As exemplified in modern French literature. Given in 1929-1930. First semester (3). Assistant Professor Toohy.

Fr. 156. FRENCH SOCIAL FORCES. Continuation of Fr. 155. Second semester (3). Assistant Professor Toohy.

SPANISH

Span. 1. ELEMENTARY SPANISH. Drill in speaking and writing. Primarily for freshmen with less than two units of entrance Spanish. First semester (3).

Span. 2. ELEMENTARY SPANISH. Continuation of Span. 1. Second semester (3).

Span. 3. ELEMENTARY SPANISH. Same as Span. 1 except that this course is given entirely in English. Primarily for freshmen with less than two units of entrance Spanish. First semester (3).

Span. 4. ELEMENTARY SPANISH. Continuation of Span. 3. Second semester (3).

Span. 5. ELEMENTARY SPANISH. Drill in speaking and writing. Primarily for upperclassmen who have shown ability in the use of other languages. First semester (3).

Span. 6. ELEMENTARY SPANISH. Continuation of Span. 5. Second semester (3).

Span. 11. INTERMEDIATE SPANISH. Continuation of Span. 2. Prerequisites: Span. 1 and 2. First semester (3).

Span. 12. INTERMEDIATE SPANISH. Continuation of Span. 11. Second semester (3).

Span. 13. INTERMEDIATE SPANISH. Continuation of Span. 4. Conducted entirely in English. Prerequisites: Span. 3 and 4. First semester (3).

Span. 14. INTERMEDIATE SPANISH. Continuation of Span. 13. Second semester (3).

Span. 15. INTERMEDIATE SPANISH. Continuation of Span. 6. Reading and discussion in Spanish of assigned texts. Prerequisites: Entrance Spanish or Span. 1 and 2. First semester (3).

Span. 16. INTERMEDIATE SPANISH. Continuation of Span. 15. Second semester (3).

Span. 17. INTERMEDIATE SPANISH. Same as Span. 15 except in the nature of the outside reading. First semester (3).

Span. 18. INTERMEDIATE SPANISH. Continuation of Span. 17. Second semester (3).

Span. 25. SPANISH NOVELS AND PLAYS. Continuation of Span. 16. Prerequisite: Span. 15. First semester (3).

Span. 26. SPANISH NOVELS AND PLAYS. Continuation of Span. 25. Prerequisite: Span. 15. Second semester (3).

Span. 27. SPANISH NOVELS AND PLAYS. Same as Span. 25 except in the nature of the outside reading. Prerequisites: Span. 17 and 18. First semester (3).

Span. 28. SPANISH NOVELS AND PLAYS. Continuation of Span. 27. Prerequisite: Span. 17. Second semester (3).

For Advanced Undergraduates and Graduates

Span. 35. SOCIAL AND HISTORIC FORCES. In Spain and the Spanish American republics as exemplified in the modern literature of those countries. Prerequisite: Span. 25 or 27. First semester (3).

Span. 36. SOCIAL AND HISTORIC FORCES. Continuation of Span. 35. Prerequisite: Span. 25 or 27. Second semester (3).

Span. 41. SPANISH FICTION OF THE SIXTEENTH AND SEVENTEENTH CENTURIES. Study of the novel in the Golden Age of Spanish literature, especially of Cervantes' Don Quixote. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span. 25 or 27. First semester (3).

Span. 42. SPANISH DRAMA OF THE SIXTEENTH AND SEVENTEENTH CENTURIES. Plays of Lope de Vega, Tirso de Molina and Calderón. Collateral reading in modern Spanish prose dealing with the subject of the course, and reports. Prerequisite: Span. 41. Second semester (3).

Span. 43. SEMINAR. A study of the works of some author or group of authors or of a period. Prerequisite: Span. 25 or 27. First semester (3).

Span. 44. SEMINAR. Continuation of Span. 43. Prerequisite: Span. 25 or 27. Second semester (3).

For Graduates

Prerequisites: Graduate students who major in Spanish must have completed not less than twelve semester hours of Spanish language and literature above the standard intermediate courses. A reading knowledge of Latin and French is desirable.

Span. 101. OLD SPANISH. Ford's *Old Spanish Readings*. Given in 1928-1929. First semester (3). Mr. Soto.

Span. 102. OLD SPANISH. Continuation of Span. 101. Second semester (3). Mr. Soto.

Span. 151. THE MODERN SPANISH NOVEL. Works of Galdós, Alarcón, Valera, Pereda, Valdés, Pardo Bazan, Ibáñez, Valle Inclan, Baroja. Reading, reports and lectures. Given in 1929-1930. First semester (3). Mr. Soto.

Span. 152. THE MODERN SPANISH NOVEL. Continuation of Span. 151. Second semester (3). Mr. Soto.

PORTUGUESE

PORT. 1. ELEMENTARY PORTUGUESE. Grammar and composition; rapid reading of modern literature with particular reference to the history and social and economic conditions in Brazil and Portugal. First semester (3).

Port. 2. ELEMENTARY PORTUGUESE. Continuation of Port. 1. Second semester (3).

Port. 11. INTERMEDIATE PORTUGUESE. Continuation of Port. 2. Prerequisites: Port. 1 and 2. First semester (3).

Port. 12. INTERMEDIATE PORTUGUESE. Continuation of Port. 11. Second semester (3).

ITALIAN

Ital. 1. ELEMENTARY ITALIAN. Grammar and composition; Rapid reading of easy modern prose. First semester (3).

Ital. 2. ELEMENTARY ITALIAN. Continuation of Ital. 1. Second semester (3).

Ital. 11. Intermediate Italian. Masterpieces of classic periods. Outside reading. Prerequisites: Ital. 1 and 2. First semester (3).

Ital. 12. Intermediate Italian. Continuation of Ital. 11. Second semester (3).

SPANISH

See Romance Languages

CHAPEL

University Chapel Exercises are held daily from Monday to Friday, inclusive, from 7.45 to 8.00 a.m. Attendance at these exercises is voluntary for juniors and seniors but required of freshmen and sophomores; except that freshmen and sophomores who prefer to do so may elect one year of Ethics or Philosophy of Religion, two semester hours, in lieu of Chapel. For students who elect Chapel, three attendances a week out of the possible total of five give a passing grade.

COLLEGE LECTURES

From time to time distinguished men in science, letters and arts give lectures before the student-body. Freshmen, sophomores and juniors are required to attend the college lectures. Those who attend three-fifths of the lectures given in a semester are credited with having satisfied this requirement. Students who fail to meet this requirement must elect during the junior or senior year a substitute of the value of one credit hour.

INSPECTION TRIPS

Inspection trips to industrial plants are a required part of specific courses in the various curricula in engineering. Written reports or examinations are required. These trips are under the general direction and supervision of the Faculty Committee on Inspection Trips. A copy of the itinerary and a circular letter is sent to the student's parents or guardian before each trip. This letter will call attention to the fact that the University assumes no responsibility for accidents which may occur during the trip.

THE SUMMER SESSION

The various courses given during the summer are administered by the Director of the Summer Session and a faculty consisting of those teaching in the Summer Session. All courses are conducted in accordance with the same standards, and may be credited towards a degree on the same basis, as courses given in the first and second semesters.

The courses offered during the Summer Session are arrraged in three distinct groups:

A. Courses which are an integral part of certain engineering curricula.

B. Courses in a large variety of subjects offered primarily for undergraduates who wish to secure advanced credits or to make up deficiencies.

C. Professional courses designed primarily for teachers.

Certificates of academic credit are issued, on request, for all courses satisfactorily pursued.

The following courses were offered in the summer of 1927. The Summer Session Announcement, containing full description of courses to be offered in 1928, and information concerning admission, fees, etc., will be sent to any address on request.

A. REQUIRED COURSES IN ENGINEERING

June 6 to July 2

C.E. 6	Land and Topographic Surveying	(4)
Chem. 39	Assaying, Coal, Gas and Oil Analysis	(4)
M.E. 24	Engineering Laboratory	(4)

July 4 to July 16

C.E. 7	Railroad Surveying	(2)

B. OPTIONAL COURSES

July 6 to August 16

Astr. 1	Descriptive Astronomy	(3)
Biol. 7	Elementary Biology	(3)
Biol. 9	Human Biology	(3)
Biol. 52	Bacteriology	(3)
Bus. 1	Industrial Evolution	(3)
Bus. 2	Industrial Evolution	(3)

Bus. 3	Economics	(3)
Bus. 4	Economics	(3)
Bus. 11	Accounting	(3)
Bus. 12	Accounting	(3)
Chem. 1	Elementary Chemistry	(2)
Chem. 3	Intermediate Chemistry	(2)
Chem. 6.	Advanced Chemistry	(3)
Chem. 7	Advanced Chemistry	(3)
Chem. 8	Stoichiometry	(1)
Chem. 11	Chemistry Laboratory	(2)
Chem. 12	Chemistry Laboratory	(1)
Chem. 13	Chemistry Laboratory	(2)
Chem. 14	Chemistry Laboratory	(1)
Chem. 20	Qualitative Analysis	(3)
Chem. 21	Qualitative Analysis	(2)
Chem. 31	Quantitative Analysis	(3)
Chem. 33	Quantitative Analysis	(3)
Chem. 35	Quantitative Analysis	(3)
Chem. 36	Quantitative Analysis	(2)
Chem. 37	Quantitative Analysis	(2)
Chem. 41	Quantitative Analysis Conference	(1)
Chem. 43	Quantitative Analysis Conference	(1)
Chem. 44	Quantitative Analysis Conference	(1)
Chem. 45	Quantitative Analysis Conference	(1)
Chem. 46	Quantitative Analysis Conference	(1)
Chem. 48	Quantitative Analysis Conference	(1)
Chem. 49	Quantitative Analysis Conference	(1)
C.E. 1	Engineering Drawing	(2)
C.E. 2	Engineering Drawing	(2)
E.E. 1	Electrical Distribution	(1)
E.E. 2	Direct Current Machinery	(3)
E.E. 3	Dynamo Laboratory, Elementary	(1)
E.E. 8	Dynamo Laboratory, Intermediate, A.C.	(1)
E.E. 50	Dynamos and Motors, General	(2)
E.E. 51	Dynamo Laboratory, Beginning	(1)
E.E. 52	Alternating Currents, General	(2)
E.E. 53	Dynamo Laboratory, Intermediate	(1)
Eng. 1	Composition and Rhetoric	(3)
Eng. 2	Composition and Rhetoric	(3)
Eng. 15	History of English Literature	(3)

Eng. 16	English Literature from 1800 to the Present	(3)
Eng. 17	Contemporary Drama	(3)
Eng. 29	Literary Criticism	(3)
Fr. 2	Elementary French	(3)
Fr. 12	Intermediate French	(3)
Ger. 2	Elementary German	(3)
Ger. 4 or 6	Intermediate German	(3)
Ger. 10	Goethe's Faust	(3)
Govt. 51	American Government (National)	(3)
Hist. 7	History of England to 1603	(3)
Hist. 12.	American Colonial History	(3)
Hist. 14	United States History	(3)
Hist. 117	America as a World Power	(3)
Math. 1	Solid Geometry and Trigonometry	(3)
Math. 2	Algebra	(3)
Math. 3	Analytic Geometry	(3)
Math. 92	Differential Calculus and Solid Analytic Geometry	(4)
Math. 93	Integral Calculus	(4)
Math. 94	Differential Equations	(1)
Math. 95	Analytic Mechanics	(2)
M.E. 1	Elementary Machine Design	(3)
M.E. 2	Elementary Heat Engines	(3)
M.E. 4	Elementary Machine Design	(3)
M.E. 5	Heat Engines	(3)
M.E. 6	Mechanism	(4)
Phil. 4a	Man Thinking	(3)
Phil. 11	Ethics	(1)
Phil. 102	History of Philosophy, Modern	(3)
Psych. 1	General Psychology	(3)
Psych. 4	Social Psychology	(3)
Psych. 5	Introduction to Psychology	(3)
Psych. 6	Abnormal Psychology	(3)
Psych. 10	Principles of Psychology	(3)
Psych. 15	Psychology Applied to Business and Industry	(3)
Phys. 1	General Physics	(3)
Phys. 1a	Physics Laboratory	(1)
Phys. 2	General Physics	(3)
Phys. 3	Physics Laboratory	(1)
Phys. 4	Elementary Electricity and Magnetism	(3)

Phys. 5	Physics Laboratory	(1)
Phys. 7	Physics Laboratory	(1)
Phys. 8	Introduction to the Mathematical Theory of Electricity and Magnetism	(2)
Phys. 9	Theory of Electricity and Magnetism; Pyrometry and Pyrometric Measurements	(2)
Phys. 12	Elementary Physics	(3)
Phys. 13	Elementary Physics	(3)
Span. 2	Elementary Spanish	(3)
Span. 12	Intermediate Spanish	(3)
Span. 25	Intermediate Spanish	(3)

C. PROFESSIONAL COURSES FOR TEACHERS

July 6 to August 16

Educ. 9	Principles of Education	(3)
Psych. 2	Educational Psychology	(3)
Psych. 13	Clinical Psychology	(2)

LEHIGH INSTITUTE OF RESEARCH

The Lehigh Institute of Research was organized in 1924 to encourage and promote scientific research and scholarly achievement in every division of learning represented in the organization of the University, and in recognition of the need for further and more exact knowledge in science and in the applications of science to the affairs of modern life.

The purposes of the Institute of Research include (1) the training of men for research work, (2) the publication of the results of investigations, (3) the conduct of general research, (4) the conduct of cooperative research, (5) the conduct of commercial tests and advisory service.

Detailed information concerning the organization and regulations of the Institute of Research are given in a pamphlet which will be furnished on request.

GENERAL STATEMENT

Lehigh University was chartered by the Legislature of Pennsylvania by an act dated February 9, 1866. In 1865 the Hon. Asa Packer, of Mauch Chunk, inaugurated a movement to provide an institution that would afford training and education in the learned professions as then recognized, and in technical branches, the importance of which was then just becoming apparent in the development of the industrial and transportation interests of the country. He made an initial donation of a large tract of land for this purpose and the sum of $500,000, to which he added largely during his lifetime and by his will.

Since its foundation the equipment and resources of the University have steadily increased through the continued interest of the University's trustees, alumni and friends. The present endowment totals $5,024,490.40. The first important addition to the University's original plant was the Sayre Observatory, donated in 1869 by Robert H. Sayre, of Bethlehem. Later donations include Packer Memorial Church, 1887; Williams Hall, 1902; Drown Memorial Hall, 1907; the Armory, 1907; the Wilbur Heating Plant and Engineering Laboratory, 1907; Taylor Hall, 1907; Sayre Park, 1909; the Coxe Mining Laboratory, 1910; the Fritz Engineering Laboratory, 1910; Taylor Gymnasium and Taylor Field, 1913; the Alumni Memorial Building, 1924; the James Ward Packard Electrical and Mechanical Laboratory, 1926.

BUILDINGS AND GROUNDS

The University occupies nineteen buildings and its grounds cover one hundred eighty acres on the north side of South Mountain, overlooking the valley of the Lehigh River and the city of Bethlehem.

PACKER HALL

Packer Hall, completed in 1869, is four stories in height, 215 feet long and 60 feet wide. It is built of sandstone in the English Gothic style of architecture.

The Department of Civil Engineering occupies the greater part of the first and second floors. On the first floor are a lecture room, two recitation rooms, a large drawing hall, two instrument rooms, two offices and a library room. The instrument rooms contain forty-five transits, forty-five levels, a large geodetic theodolite, ten plane tables and other instruments for engineering field work. In the library room is a collection of plans of engineering structures. On the second floor are two drawing-rooms, three recitation rooms and offices.

The offices and recitation rooms of the Department of Mathematics and Astronomy are located on the third and fourth floors.

The offices and class rooms and laboratory of the Department of Philosophy, Psychology and Education are on the first and second floors. The laboratory has the standard equipment for the several courses in experimental psychology that are offered.

THE WILLIAM H. CHANDLER CHEMISTRY LABORATORY

The Chemistry and Metallurgy laboratories are contained in a fire-proof sandstone building, 259 feet in length by 44 in width, with two wings, each 62 feet in length by 42 feet in width. An extension of the Chemistry Laboratory, three stories high, in architectural conformity with the main building, has inside dimensions of 60 feet by 37 feet.

In the Chemistry Laboratory there are two principal stories, a basement and a top story given over to the laboratory for physical chemistry. The upper floor is occupied by the quantitative and the qualitative chemical laboratories. These rooms are 22 feet in height, and are well lighted and ventilated. Laboratories for research chemistry and the supply room are also on this floor.

The first floor contains a large lecture room, a smaller lecture room, a recitation room, a chemical museum and laboratories for organic chemistry and sanitary chemistry.

In the basement is a large laboratory for the furnace assay of ores and a well-appointed laboratory for gas analysis; also rooms containing the apparatus for processes in industrial chemistry, steam engine and dynamo and motor installation, air pump for pressure and vacuum filtration, etc.

The laboratories of the Department of Chemistry are equipped with apparatus for teaching chemistry and chemical engineering and for research investigations.

The Metallurgy Laboratory contains a lecture room; a museum of metallurgical collections; an extensive departmental library; apparatus for the projection of lantern slides of industrial operations, opaque objects and moving pictures; a dark room for photographic work; a laboratory provided with two Le Chatelier and one Leitz metallographic microscope complete with camera; a dry laboratory provided with gas and electric furnaces, and electric current for electrometallurgical experiments; and a wet laboratory for work in electrochemistry and for making analyses incidental to metallurgical research; also in Williams Hall a welding laboratory equipped with industrial welding apparatus of all the chief types, for demonstration and research purposes. Equipment is provided for laboratory work in metallurgy, in metallography, and in electrometallurgy, consisting of gas, electric current and apparatus for various kinds of experimental work, such as testing the hardness of metals by the methods of Brinell, Rockwell and Shore, for testing steel by magnetic methods, etc. Several new pyrometers, microscopes and furnaces have been added recently to the general equipment. This department is equipped for instruction in metallurgy and electrometallurgy and for conducting original investigation in these departments of science.

The Trustees of the University named this building the William H. Chandler Chemistry Laboratory in recognition of Dr. Chandler's thirty-five years' service as Professor of Chemistry, 1871-1906.

THE PHYSICS AND ELECTRICAL ENGINEERING LABORATORY

The Physics and Electrical Engineering Laboratory is 240 feet long, 44 to 56 feet wide and four stories high. The halls and stairways, the photometer rooms and all apparatus rooms are of fire-proof construction. The remainder of the building is of heavy mill construction.

On the first floor are the advanced electrical laboratory and shops of the Department of Physics, the senior and junior dynamo laboratories, the shop and calibration room of the Department of Electrical Engineering.

The dynamo laboratory equipment, which is being constantly increased, now includes upwards of 120 generators and motors of widely varying types, 30 transformers and about 230 measuring instruments.

The laboratory for senior students in the west wing is supplied with power from a 75-kilowatt rotary converter receiving current through two 30-kilowatt transformers. The laboratory equipment now includes the following apparatus: an 18-kilowatt double current generator, two direct motor-generator units, one Lincoln variable speed motor, a 4-kilowatt Westinghouse two-phase rotary converter, a 10-kilowatt General Electric six-phase compound rotary converter, two direct connected units consisting of 7½-kilowatt six-phase General Electric alternators driven by 15-horse power Allis-Chalmers motors, one 20-kilowatt two- (or three-) phase alternator built by the Department, a 35-kilowatt Westinghouse single-phase alternator, two 15 K.V.A. G.E. special twelve-phase A.C. generators with driving motors, one pair of 15 K.V.A. Westinghouse special twelve-phase direct connected generators for special pump-back and efficiency tests, a 3-horse power G.E. transmission dynamometer, two 7½ K. W. Westinghouse direct connected D.C. compound generators, a pair of 3-horse power direct connected series crane motors, three motor-generator sets converting from alternating to direct current, four polyphase induction motors ranging from 2-horse power to 7½-horse power, three types of single-phase induction motors, two single-phase commutator motors, twenty-two transformers of from 1 to 15-kilowatts, including two 15-kilowatt Scott-connected transformers, a 5-kilowatt 66,000-volt testing transformer, a 6-light constant current transformer, a 30-ampere arc rectifier outfit complete, a General Electric oscillograph outfit, a Crane lecture room oscillograph, and a variety of instruments, including voltmeters, ammeters, wattmeters, rheostats, frequency meters, dynamometers, condensers, and other apparatus.

The laboratory for junior students on the first floor in the west wing contains the following apparatus: a 20-kilowatt Ferranti alternator driven by a direct current motor, two arc light machines, twenty arc lamps of various types, a Brackett cradle dynamometer, two Westinghouse two-phase rotary converters, a motor driven battery-booster set, several types of adjustable speed motors, a special G.E. motor driven sine wave generator and other motors for direct and alternating currents.

On the second floor are the offices of the Departments of Physics and Electrical Engineering, two general apparatus rooms, a large laboratory room for Physics, a small research laboratory, a large dynamo laboratory for sophomore students in Electrical Engineering, and an Electrical Engineering reading room. The dynamo laboratory for sophomore students in the west wing is equipped with twenty-seven direct current machines of various types, dynamometers, and several types of automatic starters and auxiliary apparatus.

On the third floor are the lecture room, apparatus rooms and photometer rooms of the Department of Physics, and the lecture room, recitation rooms, apparatus room and radio laboratory of the Department of Electrical Engineering.

Apparatus exemplifying the operation of telegraph, telephone, and radio telegraph and telephone stations are installed in the communication laboratory on the third floor which includes a 3000-volt direct current generator, several high tension transformers, a number of types of radio sending and receiving equipment, an artificial telephone line and telephone exchange apparatus, a Western Electric multiple frequency generator, condensers, vacuum tubes of various powers, high frequency bridges and instruments for making tests.

On the fourth floor are recitation rooms, a large laboratory and several small photometric rooms of the department of Physics.

THE W. A. WILBUR ENGINEERING LABORATORY AND POWER HOUSE

The W. A. Wilbur Engineering Laboratory was erected in 1902; in 1907 the original building was doubled in size to provide for the heating and lighting plant of the University. The building is of sandstone, conforming in material to the adjacent Chemistry and Physics Laboratories. It is 44 feet wide by 188 feet long, one story high in the boiler room, but with a raised engine room forming a second story at either end.

The boiler equipment of the laboratory consists of two watertube boilers rated at about 100-horse power each, one of Babcock & Wilcox, the other of Sterling type. In the heat and light plant there are three 250-horse power Sterling boilers, with room for a fourth unit of equal or greater capacity. Each section has its own set of feed pumps and other auxiliaries, in the arrangement of which special provision has been made for easily conducting performance tests. The laboratory boilers are connected to the chimney of the old boiler house, and have also an induced draft outfit. The chimney of the newer plant is of radial brick construction, 125 feet high, and a forced draft equipment may be installed when need for increased capacity arises.

A coal-storage yard north of the building has room for a season's supply of coal, and a system of belt-conveyors and bucket-elevators is provided for receiving coal, dumping it on storage pile and conveying it into the boiler room as needed.

The engine room of the laboratory contains a 100-horse power turbine, a vertical triple-expansion engine of 75-horse power, a 60-horse power compound two stage Ingersoll air compressor, two small vertical engines, a simple Ball engine direct connected to a 25-kilowatt Crocker-Wheeler generator, and a 5-horse power De Laval steam turbine. There is also a complete set of Westinghouse airbrake apparatus, with four freight car brakes. The airbrake pump and all the other small motors, including the feed and condenser pumps, are piped to the surface condensers beneath the engine room floor. There are two large condensers of 150- and 60-horse power capacity respectively, with smaller ones for the pumps and for special experiments. Besides the various engines there are a large belt dynamometer, apparatus for testing gages, indicators, thermometers, steam calorimeters, and other instruments, for experiments on flow of steam, for testing injectors, etc. The exhaust system includes a Cochrane feed-water heater of 250-horse power capacity.

A floor space of 45 feet by 70 feet in the old boiler house is now used as a laboratory. It contains a 150-horse power suction gas producer for anthracite coal, gas engine, gasoline engine, complete Sprague electric dynamometer, and fan blower, all equipped for laboratory testing.

This building bears the name of Mr. W. A. Wilbur in grateful recognition of the work he has done for Lehigh University.

WILLIAMS HALL

Williams Hall, the donation of Dr. Edward H. Williams, jr., of the Class of '75, was so named by the Trustees of the University not only in recognition of this gift but also of Dr. Williams' long continued and important service to the University as an alumnus and as Professor of Mining and Geology.

Williams Hall is 186 feet long by 70 feet wide and covers a ground area of over 12,000 square feet. One-half of the building is devoted to the Department of Mechanical Engineering and the other half to the Departments of Geology and Biology.

In the eastern end there are recitation rooms, instructors' offices, drawing rooms, reference library and store-rooms of the Department of Mechanical Engineering, and in the basement rooms and apparatus are provided for laboratory work in experimental mechanics and engineering physics, such as the calibration of the measuring instruments used in mechanical engineering, the determination of the mechanical efficiencies of hoisting and other gear, and the testing of motors. In this section there are electric motors, a water motor, a 15-horse power centrifugal pump, hoists, blocks, jacks and dynamometers of various kinds.

In the west end the Department of Geology has on the first floor two lecture rooms, two offices, library, mineralogical museum, and laboratory of petrology and petrography. The lecture rooms contain specimens of rocks and fossils and a collection of economic minerals and ores. The main lecture room is fitted with a stereopticon for illustrated lectures. The laboratory of petrography is provided with fifteen petrographic microscopes and study collections of rocks and minerals. The collection of rocks contains over six thousand specimens from type regions in different parts of the world. The mineralogical museum contains many valuable collections representing all the prominent mineral locations in the world. The recording instruments of the meteorological observatory are also located on the first floor.

In the basement are the mineralogical laboratory, the blowpipe analysis laboratory, a small chemical laboratory for analytical work, and a room fitted with apparatus run by a one-horse power motor for cutting thin sections of rock. On the second floor is the paleontological museum, which contains the fossil collections. On the third floor is a room fitted as an office and laboratory, containing a Goldschmidt two-cycle goniometer and other apparatus for advanced work in crystallography.

On the third floor there are the drawing room and an office of the Department of Mining Engineering, also well-equipped blue-print and dark rooms and a photographic laboratory used jointly by the Departments of Mining Engineering and Geology.

The Department of Biology has its lecture room, office reference library, laboratories and store rooms on the second floor, and a large vivarium on the third floor. The laboratories of this Department are thoroughly equipped with collections, sections, microscopes, and necessary appliances.

The students' rooms, used by the Mining and Metallurgical Society and by the Mechanical Engineering Society, are located in the basement.

THE FRITZ ENGINEERING LABORATORY

The late John Fritz, of Bethlehem, known as the father of the steel industry in the United States, a member of the Board of Trustees dating from the founding of the University, gave to the University the funds for the erection and thorough equipment of an engineering laboratory. The building was designed and erected in 1910 under the personal supervision of Mr. Fritz. The building is equipped with a general testing section for testing iron and steel, a cement and concrete section, and a hydraulic section. The equipment is used by the Civil Engineering Department in connection with courses in Mechanics of Materials, Hydraulics, and Cement and Concrete. Any student in the University who has the proper preparation may receive instruction in this laboratory.

The building is of modern steel frame construction, 94 feet wide and 115 feet long, with the main central section 65 feet in height, and two side sections of lesser height.

The external walls which enclose the steel frame are of cement brick lined on the inside with red brick. A traveling crane, of 10-ton capacity, operated by electricity, commands the entire central portion of the building in which the testing of large specimens is carried on.

The general testing section is equipped with an 800,000-pound Riehle vertical screw testing machine, capable of testing columns 25 feet long or less, tensile specimens 20 feet long or less, and transverse specimens up to lengths of 30 feet; an Olsen universal testing machine of 300,000 pounds capacity; smaller machines for ordinary tension, compression, transverse and torsion tests; a cold-bend testing machine, and a small machine shop. The hydraulic section occupies the east end of the main room and is equipped with various tanks, weirs, pumps and other apparatus for studying problems in hydraulics. The cement and concrete section has a large room for the making and testing of specimens and a room for the storage of materials.

THE ECKLEY B. COXE MINING LABORATORY

The Eckley B. Coxe Mining Laboratory is a building of dressed sandstone 100 feet long by 75 feet deep, and is occupied exclusively by the Department of Mining Engineering.

The main part of the building contains the Ore Dressing and Coal Preparation Laboratory; the west wing contains a chemical, fuel, and assay laboratory equipped for research, a balance room and a sampling laboratory; the east wing contains the office, a recitation room and an instrument room. There is a locker and wash room in the basement of the east wing.

The equipment for the main laboratory consists of a gyratory crusher, rolls, screens, jigs, roller mill, classifiers, concentrators (tables and vanner), gravity stamps, amalgamating plates, grinding pan, with the necessary apparatus, including grizzly, elevators, feeders, sand-pumps, settling tanks, dryers, and electric motors. The sampling laboratory contains a small jaw crusher, a small gyratory crusher, rolls, sample grinder, magnetic separator, screening and sampling equipment.

The machinery is driven by separate motors, and any one part or all of it can be operated at will, permitting experimental studies and tests of individual machines or groups of machines, or of an entire process, as occasion may require. The entire plant is thus flexible and enables combinations of processes in order to determine the best method to pursue in the treatment of ores, by coarse and fine concentration, and in the preparation of coals by tables, washing and sand flotation.

Owing to the prominence which flotation methods have assumed in concentration, a special department of the main laboratory has been equipped for this work, and several types of testing machines have been installed, including a Chance Coal Cleaner, together with the necessary equipment of motors, air compressors, etc., for their operation.

The laboratory also contains the following equipment: large and small size Ingersoll-Rand rock drills, Stoper and Jackhammer drills, an Ingersoll-Rand pick machine for coal mining, a Water-Leyner rock drill, a Sullivan hand-power diamond drill and a Temple-Ingersoll electric-air drill.

The laboratory was named by the Trustees of the University The Eckley B. Coxe Mining Laboratory in memory of Eckley B. Coxe, who was a pioneer and a leader in the profession of mining engineering in this country, and an active friend and valued Trustee of the University from its early days until his death. The Engineering and Mining Laboratories of Lehigh University, bearing the names of John Fritz and Eckley B. Coxe, record the friendship and close association of these two great engineers in their lifetime, and their active interest in Lehigh University.

CHRISTMAS-SAUCON HALL

During the summer of 1926, Christmas and Saucon Halls were remodelled and joined by the addition of a four-story central building.

Christmas Hall has historic interest as the first building of Lehigh University. It was originally a church, which was purchased from the Moravian Congregation. In the earliest years of the University it contained a chapel, lecture rooms, and students' dormitory. After Packer Hall was completed in 1868, Christmas Hall and Saucon Hall were utilized as students' dormitories and mess hall up to 1885. For many years thereafter Christmas Hall was used by the

Departments of Latin, Greek and Modern Languages, and Saucon Hall by the Department of English.

Christmas-Saucon Hall contains the office of the College of Business Administration, the offices, lecture rooms and recitation rooms of the Departments of English and of Economics, Sociology and Business Administration, and the offices and dispensary of the Students' Health Service.

COPPEE HALL

Coppée Hall, formerly the Gymnasium, was completely renovated in 1913 to adapt it to the needs of the College of Arts and Science. On the first floor are the offices of the College of Arts and Science and a lecture room, the office and recitation rooms of the Department of German. On the second and third floors are the offices and recitation rooms of the Departments of Latin, Greek, Romance Languages, History and Government, and Fine Arts.

SAYRE OBSERVATORY

By the liberality of the late Robert H. Sayre, one of the Trustees of the University, an Astronomical Observatory was erected on the University grounds and placed under the charge of the Professor of Mathematics and Astronomy.

The Observatory contains an equatorial telescope by Alvin Clark, of six inches clear aperture and of eight feet focus; a zenith telescope, by Blunt; a modern zenith telescope of four and one-half inches clear aperture; a superior astronomical clock, by William Bond & Son; a meridian circle; a prismatic sextant, by Pistor and Martins; an engineer's transit and a sextant, by Buff and Buff. Students in practical astronomy receive instruction in the use of the instruments and in observation.

The land upon which the Observatory stands, consisting of seven acres adjoining the original grant, was presented to the University by the late Charles Brodhead, of Bethlehem.

THE PACKER MEMORIAL CHURCH

The Packer Memorial Church, in which daily chapel exercises are held, was the gift of the late Mrs. Mary Packer Cummings, daughter of the Founder of the University. It was built in 1887 and is one of the largest churches in the State.

THE UNIVERSITY LIBRARY

The Library building was erected by the Founder of the University in 1877 as a memorial to his daughter, Mrs. Lucy Packer Linderman.

The building is semi-circular with a facade in the Venetian style of architecture. It is constructed of Potsdam sandstone with granite ornamentation. In the interior there is a reading room 40 by 50 feet, from which radiate bookcases extending from floor to ceiling; two galleries afford access to the upper cases. One hundred and seventy-three thousand volumes are now upon the shelves. The list of periodicals numbers about five hundred. The Library is especially rich, for one of its size, in materials for research in history, American newspapers and the history of early science, and in files of technical journals.

Small working reference collections for laboratory use are maintained by the departments of Biology, Geology, Chemical, Civil, Mechanical and Mining Engineering.

The Library is open from 8 a.m. to 9 p.m., except on Sundays and holidays.

The use of the Library, with privilege of taking out books, is offered to all members of the University—faculty, students, and alumni. Students are allowed free access to the books and are encouraged to become familiar with methods of using a library for literary and scientific work. The privileges of the Library are also extended to all qualified residents of the city. The Library offers its services to the industries located in the community.

The Eckley B. Coxe Memorial Library

In memory of Eckley B. Coxe, for many years a Trustee of the University, Mrs. Coxe presented to the University his technical library, consisting of 7727 volumes and 3429 pamphlets. As the working library of a man who was remarkable for the extent and thoroughness of his acquaintance with the whole field of applied science, this collection possesses great value for scientific and engineering students.

The Joseph W. Richards Library

The Joseph W. Richards Library of Metallurgy and Chemistry, consisting of about 3000 volumes, is located on the second floor of the William H. Chandler Chemical Laboratory, and is open for use under the supervision of the Department of Metallurgy.

TAYLOR HALL

Taylor Hall, the gift of Mr. Andrew Carnegie, is a commodious concrete dormitory situated in the University Park, south of Packer Hall. It accommodates 137 students. There are suites of three rooms (a study and two adjacent bedrooms), for two occupants, and a few single rooms. The building was named Taylor Hall by Mr. Carnegie in honor of Mr. Charles L. Taylor, his former partner in business, a graduate of the University in the Class of 1876 and a Trustee of the University. The rates for the suites of rooms are $100 or $120 a year for each occupant. The single rooms are $50, $65 or $80 a year.

PRICE HALL

Price Hall furnishes dormitory accommodation for thirty-four students. It was named in honor of Dr. Henry R. Price, an alumnus of the University of the Class of 1870, late President of the Board of Trustees.

DROWN MEMORIAL HALL

Drown Memorial Hall is a memorial to the late Thomas Messinger Drown, LL.D., President of the University from 1895 to 1904. The building was erected by his friends and the alumni of the University and is devoted to the social interests of the University students. It contains study, reading, conversation and chess rooms, an assembly hall, and the offices of the Lehigh University Union, the Bureau of Student Employment and Housing, the college publications, and the dramatic and musical organizations. A cafeteria is located in the basement.

LEHIGH ALUMNI MEMORIAL BUILDING

The Alumni Memorial Building, completed and occupied in the fall of 1924, stands as a memorial to the more than 1900 Lehigh men who served in the World War, and especially in memory of the 46 who gave their lives. The cost of erection was raised by subscription from about 1700 alumni. It is used as the administration building of the University. The Memorial Hall beneath the great tower contains the records in bronze of the Lehigh men who served and those who died, together with mementos of the War.

In the south wing of the building are the offices of the President of the University, the Vice-President and Comptroller, the Dean, the Registrar and the Bursar, with their staffs. There is also a large faculty committee room in this wing. The north wing contains the offices of the Alumni Association and the Treasurer of the University, the University Supply Bureau, and the offices of the Lehigh Institute of Research, as well as a large room used for faculty meetings, receptions, dances, etc. This hall is also used for the annual meeting of the Alumni Association and meetings of the Alumni Council.

Not only was this building made possible by alumni gifts and built under their supervision, but the architects were Lehigh men: J. L. Burley, '94, and T. C. Visscher, '99.

TAYLOR GYMNASIUM AND FIELD HOUSE

In 1913 Mr. Charles L. Taylor, a graduate of the University of the Class of 1876 and a member of the Board of Trustees, donated to the University the funds required for the erection of a gymnasium and a field house.

Taylor Gymnasium is situated at the extreme east end of the grounds of the University, adjoining the athletic field. The building is 222 feet long by 73 feet wide. On the ground floor at the north end is located the game room, 93 by 70 feet, used for basketball and wrestling. The game room is surrounded by a gallery for spectators. The main gymnasium floor measures 90 by 70 feet. Other rooms in Taylor Gymnasium are the offices and measuring room of the Department of Physical Education, a large trophy room, basketball and handball courts, fencing, boxing and wrestling rooms, and locker rooms with accommodations for the entire student body.

The gymnasium is equipped with all modern appliances for recreative and corrective exercises, also with apparatus for calisthenics and other gymnastics, both for individual and for class work.

In addition to numerous hot and cold shower baths, adjoining the locker rooms is a swimming pool, 75 by 25 feet, with a depth from 4½ feet to 9½ feet. The capacity of the swimming pool is 95,000 gallons.

Adjoining the gymnasium and the stadium is the Taylor field house. It is two stories in height, and has dressing rooms, lockers and shower baths for visiting and Lehigh teams, and also rooms for medical attention to athletes.

TAYLOR FIELD

An athletic field of more than nine acres in area is provided by the University for the accommodation of students who participate in the various outdoor sports. The Stadium, located on the north side, or lower level, provides football and baseball fields. It is surrounded by concrete stands having a seating capacity for more than 12,000 spectators. On the upper level there are practice fields for football, baseball, lacrosse and soccer; also a quarter mile track and a 220-yards straightaway, furnishing ample room for exercise by the entire student body. During the winter months a wooden outdoor running track, twelve laps to the mile, is provided.

A cage with 60 by 120 feet floor space affords facilities for indoor baseball, lacrosse, and track and field sports practice.

LEHIGH FIELD

An additional athletic field of ten acres in area, with field house, covered grandstand and bleachers, located about a mile from the University campus, was acquired in 1925.

ARMORY

During the summer of 1926 the building originally erected as the University Commons was thoroughly renovated to adapt it to the needs of the Department of Military Science and Tactics. The building contains the offices, class rooms, storage rooms and indoor rifle and pistol range of that department.

THE JAMES WARD PACKARD ELECTRICAL AND MECHANICAL LABORATORY

James Ward Packard, who was graduated from Lehigh University in 1884 with the degree of Mechanical Engineer, the designer of the first Packard motor car, the founder of the Packard Motor Car Company of Detroit, Michigan, and of the Packard Electric Company of Warren, Ohio, has donated one million dollars for the erection of an electrical and mechanical engineering laboratory.

With this amount available it is expected that the physical plant of the University in these two departments will be unexcelled.

SAYRE PARK

A development of the mountain side of the University grounds was effected through the donation to the University in 1909 of the sum of $100,000 by the children of the late Robert H. Sayre, to be applied and used in the development of Sayre Park as a memorial to their father. Mr. Sayre was a Trustee of the University from its foundation in 1866 to his death in 1907. He was for many years President of the Board of Trustees and Chairman of the Executive Committee of the Board.

THE ARBORETUM

The Arboretum is a tract of about eleven acres added in 1909 to the upper end of Sayre Park. It was established by a friend of the University as a tree nursery for the purpose of furnishing illustrative specimens of American trees, and of cultivating trees and shrubs for the beautifying of the Park. All of the more important species of North American trees are to be found in the University Park and the Arboretum. Adjoining the Arboretum a tract of seven acres has been planted with a variety of indigenous trees as an exhibition growth of tree culture.

THE UNIVERSITY MUSEUMS

The University Museums include large collections illustrating various branches of Chemistry, Metallurgy, Geology, Mineralogy, Zoölogy and Archaeology.

The Metallurgical Cabinet contains specimens illustrating the various processes for obtaining the more common metals.

The Zoölogical collections include the Packer collection of recent shells and the Werner collection of American birds. The latter contains over three hundred and fifty species. In most cases, in addition to the adults, specimens in different plumages as well as the nests and eggs are represented.

The Geological and Mineralogical Museums are housed in the west end of Williams Hall, and contain the Roepper and Keim mineral collections, collections of fossils, specimens of ore from mining districts, and extensive series of rocks which illustrate the type occurrences in different parts of the world.

The Cummings Archaeological Cabinet has three thousand specimens and includes Dr. Stubb's collection of Indian relics, weapons and utensils.

SCHOLARSHIPS, FELLOWSHIPS, AND PRIZES

UNIVERSITY SCHOLARSHIPS

The following scholarships are awarded annually:

1. Six free and ten deferred tuition scholarships to freshmen students, each of whom must present to the Committee on Scholarships and Loans satisfactory evidence that

(a) He is in need of financial assistance;

(b) He attained an average scholastic record which placed him in the highest third of his class in the high school or preparatory school from which he was graduated;

(c) His character and personality are such as to give promise that he will profit by a college education.

2. Eighteen free and thirty deferred tuition scholarships to students above the grade of freshmen, each of whom has completed at least one full year's work at the University and can present to the Committee on Scholarships and Loans satisfactory evidence that

(a) He is in need of financial assistance;

(b) During the previous academic year he has secured an average grade of C (approximately 10% above the passing grade) in academic subjects, *i.e.*, subjects other than physical education, chapel and college lectures.

(c) His character and personality are such that the University may properly assist him to complete his education.

3. Thirty-six deferred tuition scholarships to students in any class at the discretion of the Committee on Scholarships and Loans. These scholarships are subject to the foregoing requirements.

In no case is a scholarship awarded for more than one academic year in advance. Reappointments are subject to the foregoing regulations.

In connection with the administration of the deferred tuition scholarships, interest on the notes given in lieu of tuition is charged at the rate of 6% per annum beginning on the day the student is graduated or otherwise withdraws from the University. Applications for scholarships are regularly considered by the Committee on Scholarships and Loans on July first of each year. Applicants for freshman scholarships must submit, prior to July first, records of their academic work and statements from the principals of the schools they have attended concerning their relative class standing.

FINANCIAL AID

A student who gives satisfactory evidence of his inability to pay his expenses may apply for aid from the loan funds of the University. A student to whom a loan is granted gives a note endorsed by his parent or guardian, bearing interest at the legal rate from the date of the loan, and payable at some fixed date as agreed upon. The granting of a loan is based on a knowledge of the needs of each applicant; the decision in each case is determined by all available information, and such information is treated as confidential.

The Committee on Scholarships and Loans must be thoroughly convinced of the student's inability to pay his expenses; if it is found that an application is made as a matter of convenience to avoid the necessity of earnest effort on the part of the applicant or of his parents to obtain the necessary money from relatives or friends or from a bank, the Committee will consider such information as ground for the refusal of a loan.

The Committee may at any time require from a student to whom a loan is granted a statement of his expenses while at the University. Expenditures above what is necessary for books, instruments and laboratory fees, and for suitable but inexpensive board and lodging, will be considered as evidence that the student's circumstances are not in accord with his statement that it is impossible for himself or his parents to pay or provide for his expenses.

A loan is granted, as a rule, only to a student who has made a good record in the University. A loan is not ordinarily granted to a student during his first year of attendance.

ENDOWED SCHOLARSHIPS AND FELLOWSHIPS

Undergraduate scholarships named to honor an individual or corporation may be established in perpetuity through the payment to the Board of Trustees of Lehigh University of $10,000. The income from this donation will be paid to the holder of the scholarship to be applied towards the payment of University fees. The University will not, however, guarantee that this income will be forever sufficient to pay such fees in full.

Research fellowships named in honor of an individual or a corporation offering opportunities for graduate work and training in research in any designated field of study may be established in perpetuity through the payment to the Board of Trustees of $20,000. The income from this fund will be paid to the holder of the fellowship after the deduction of his tuition and laboratory fees. If a bequest for the establishment of a fellowship provides for half-time service as a research assistant in the Institute of Research, the remaining time to be devoted to graduate study, the University will remit the tuition fee and make only such charges against the fund as are necessary to cover the cost of materials, supplies and apparatus that need to be provided for the work of the fellow.

THE WILBUR SCHOLARSHIP

The Wilbur Scholarship was founded in 1872 by the late E. P. Wilbur and provides the sum of $200 awarded annually to the student in the Sophomore Class having the best record.

THE HENRY S. HAINES MEMORIAL SCHOLARSHIP

Mrs. Henry S. Haines, of Savannah, Ga., established in 1889 a scholarship of the annual value of $200 as a memorial to her son, Henry Stevens Haines, M.E., a member of the Class of 1887. This scholarship is devoted to the support at Lehigh University of one student in the Curriculum in Mechanical Engineering.

THE FRED. MERCUR MEMORIAL FUND SCHOLARSHIPS

Friends of the late Frederick Mercur, of Wilkes-Barre, Pa., General Manager of the Lehigh Valley Coal Company, desiring to establish a memorial to their friendship and esteem, and to perpetuate his memory, contributed and placed in the hands of the Trustees of the University a fund called "The Fred. Mercur Memorial Fund." The income from this Fund, amounting to $600, is annually awarded to students of the University.

THE ECKLEY B. COXE MEMORIAL FUND

In memory of the late Eckley B. Coxe, Trustee of the University, Mrs. Coxe established a fund, now amounting to $66,223, the interest of which is used, under the direction of the Trustees of the University, and subject to such regulations as they may adopt, for the assistance of worthy students requiring financial aid.

THE FRANK WILLIAMS FUND

Frank Williams, E.M., of Johnstown, Pa., a graduate of the Curriculum in Mining and Metallurgy of the Class of 1887, who died in October, 1900, bequeathed to the University the greater part of his estate to found a fund, now amounting to $149,853, the income of which is lent to deserving students.

NEW JERSEY ZINC COMPANY RESEARCH FELLOWSHIP

The New Jersey Zinc Company provided funds in 1924 for a research fellowship to be known as The New Jersey Zinc Company Research Fellowship, which is administered under the following regulations:

Appointment to this Fellowship is for the period of two academic years, beginning September 1 and ending June 30, with an annual stipend of $600 payable in ten installments, and freedom from University fees, except the matriculation fee and the graduation fee. Half of the time of the holder of this Fellowship must be devoted to research work in the department to which he is assigned; the other half to graduate study leading to a Master's degree at the end of the two year appointment providing all University requirements for this degree have been satisfied.

Applications for appointment to the New Jersey Zinc Company Research Fellowship may be submitted by graduates in engineering or science of colleges, universities and technical schools whose requirements for graduation are substantially the same as those at Lehigh University. Applications should be sent to the President of Lehigh University, Bethlehem, Pa., on or before March 1. Each application for this Fellowship should be accompanied by a catalogue of the institution from which the applicant was graduated, a certificate of his college work, a statement concerning his practical experience and any other evidence of his qualifications for the position which he may choose to submit. The applicant must indicate the line of graduate study he desires to undertake and his special qualifications for such work.

The holder of this Fellowship is required to devote approximately ninety hours a month independently of University holidays to research work assigned to him in the department to which he is attached; he is not permitted to accept any kind of employment for pay during either ten month period of his appointment.

THE HENRY MARISON BYLLESBY MEMORIAL RESEARCH FELLOWSHIPS

In 1926 Mrs. H. M. Byllesby, widow of Col. H. M. Byllesby, M.E., '75, President of the Byllesby Engineering and Management Corporation, provided an endowment fund for the establishment of the Henry Marison Byllesby Memorial Research Fellowships in Engineering. The income provides for two fellowships which carry an annual stipend of $750, payable in ten monthly installments, and freedom from University fees except the matriculation fee and the graduation fee.

Appointments are for two collegiate years. Half of the time of the holders of these fellowships must be devoted to research work on some problem in electrical, mechanical or hydraulic engineering, proposed by the President of the Byllesby Engineering and Management Corporation and approved by the Lehigh Institute of Research; the other half to graduate study leading to the degree of Master of Science at the end of the two year appointment, provided that all the University requirements for this degree have been satisfied.

THE COLUMBIAN CARBON RESEARCH FELLOWSHIP

The Columbian Carbon Research Fellowship for the promotion of research in Chemistry is the gift of the L. Martin Company of New York, N. Y. This fellowship carries an annual stipend of $1,000, payable in ten installments.

THE PFISTER AND VOGEL LEATHER COMPANY RESEARCH FELLOWSHIP

The Pfister and Vogel Leather Company Research Fellowship for the promotion of research in Chemistry is the gift of the Pfister and Vogel Leather Company of Milwaukee, Wisconsin. This fellowship carries an annual stipend of $500, payable in ten installments.

THE ARCHER-DANIELS-MIDLAND COMPANY AND THE WILLIAM O. GOODRICH COMPANY RESEARCH FELLOWSHIPS

Three fellowships, carrying an annual stipend of $900 each, were established in the fall of 1927 by the Archer-Daniels-Midland Company, of Minneapolis, Minn., and the William O. Goodrich Company, of Milwaukee, Wis., for research in linseed and other drying oils.

THE STUDENT CHEMISTRY RESEARCH FELLOWSHIPS

In the spring of 1927 members of the Class of 1930 established the Student Chemistry Research Fellowship Fund. This fund provides two research fellowships carrying an annual stipend of $750 each.

THE WILBUR PRIZES

A fund was established by the late E. P. Wilbur for distribution in prizes as the Faculty shall determine. This fund yields an annual income of $100.

THE JOHN B. CARSON PRIZE

An annual prize of $50 was established in 1909 by Mrs. Helen C. Turner, of Philadelphia, Pa., in memory of her father, John B. Carson, whose son, James D. Carson, was a graduate of the Civil Engineering Department of Lehigh University in 1876. It is awarded for the best thesis by a senior of the Curriculum in Civil Engineering.

THE WILLIAM H. CHANDLER PRIZES IN CHEMISTRY

Four annual prizes of $25 each, one in each class, for excellence in chemistry, were established in 1920 by the gift of Mrs. Mary E. Chandler, of Bethlehem, Pa., widow of Dr. William H. Chandler, who was Professor of Chemistry in Lehigh University from 1871 until his death in 1906. In memory of Dr. Chandler the Faculty named the prizes "The William H. Chandler Prizes in Chemistry."

THE ELECTRICAL ENGINEERING PRIZE

An annual prize of $25, established by an anonymous graduate of the Curriculum in Electrical Engineering, is awarded to the member of the graduating class presenting the best thesis in Electrical Engineering.

ALUMNI PRIZES

By a resolution of the Alumni Association of September 21, 1900, the Alumni Scholarship Fund, which was originally designed to help poor students, was, with the consent of the contributors, diverted from this purpose and the income devoted to prizes to members of the Junior Class. In 1927 two prizes of $25 each were awarded to the first honor men of the Curricula in Metallurgical and Mining Engineering. In subsequent years the prizes will be awarded to the first honor men of the technical curricula in turn.

ALUMNI PRIZES IN PUBLIC SPEAKING

The Alumni Association of Lehigh University established in 1882 annual prizes for excellence in oratory, amounting to $50. The amount of these prizes was in 1926 increased to $100 for excellence in public speaking.

THE WILLIAMS PRIZES IN ENGLISH

Professor Edward H. Williams, jr., an alumnus of the University of the Class of 1875, established in February, 1900, prizes for excellence in English Composition and Public Speaking.

The Freshmen, Sophomore and Junior Prizes are awarded by the Faculty on the recommendation of the Department of English.

Freshman Oral Composition Prizes

A First Prize of $40 and a Second Prize of $15 are awarded to freshmen of regular standing who excel in the oral composition contest held in May of each year.

Sophomore Composition Prizes

A First Prize of $50, a Second Prize of $25, and a Third Prize of $15 are awarded annually for the best three compositions submitted by sophomores of regular standing as required work in their English courses.

Junior Composition Prizes

A First Prize of $40 and a Second Prize of $15 for the best two essays submitted by juniors to the Department of English as part of the required work of their English courses.

Senior Prizes

The Senior prizes are awarded by the Faculty on recommendation of the Committee on Williams Senior Prizes.

1. Senior Prizes of $75 (First Prize), and $25 (Second Prize) are awarded annually by each of the three Departments of Economics, English, Philosophy and Psychology for dissertations submitted by regular members of the senior class on or before May 1st.

2. The Committee on Williams Senior Prizes publishes before the close of the University year a list of recommendeed subjects for dissertations, but a senior may submit a dissertation upon any other subject in the respective fields if the subject has received the approval of the Committee.

3.. Every senior entering the competition shall submit to the Committee his choice of subject and plan of work by December 1st.

4. The awards will be made by the Faculty upon recommendation of the Committee; but the Committee will recommend that no award be given if in any case a dissertation does not meet its standards of merit. This standard will include such points as excellence in thought, plan, development, argument and composition.

THE FRAZIER AND RINGER MEMORIAL FUND

This is a fund for the medical and surgical care of needy students, established in memory of Benjamin West Frazier, A.M., Sc.D., former Professor of Mineralogy and Metallurgy, and Severin Ringer, U.J.D., former Professor of Modern Languages and Literature and of History, each of whom faithfully served Lehigh University for one-third of a century. The fund was started February 12, 1906, by the donation of $13,000 by the late Robert H. Sayre. It is hoped that this fund may, by other donations, be increased in time to amount to a sum sufficient to insure free medical and surgical attendance to all students of the University requiring such aid.

GRADUATING THESES

Theses, when required, are accompanied by drawings and diagrams, whenever the subjects need such illustration. The originals are kept by the University, as a part of the student's record, for future reference, but copies may be retained by students, and may be published, permission having first been obtained from the Faculty.

PLACEMENT SERVICE

The heads of the various technical curricula of the University coöperate with graduates in securing suitable professional openings. Similarly, students who desire to teach are assisted in finding positions by the Faculty Committee on Teacher Placement. Such students are put in touch, also, with the Placement Service of the Teacher Bureau of the Department of Public Instruction of Pennsylvania at Harrisburg.

STUDENTS' HEALTH SERVICE

The Students' Health Service, organized in 1923, has general charge of all health and sanitary measures in the University. The work of the department is organized under four heads: Sanitation, Physical Examinations, Dispensary Service, Education.

SANITATION. The Director of the Health Service is in direct charge of the sanitation of University buildings and grounds, and exercises such supervision as is possible over other accommodations for students.

PHYSICAL EXAMINATIONS. Each student is required to undergo a complete physical examination each year. This examination, which is made jointly by the Health Service and the Department of Physical Education, serves the needs of both these departments and also complies with the requirements of the Reserve Officers' Training Corps. All physical defects and departures from normal are noted, and the students are divided into groups as follows: (1) those who present no abnormalities and who can proceed with the regular mental and physical work of the University; (2) those who are abnormal or sub-normal, but who should be brought up to normal by the regular courses in Physical Education; (3) those who require special or corrective measures.

Those students who fall into groups 2 and 3 are observed at regular intervals, and every effort is made to bring them up to the highest degree of physical development and health. Individual records are kept of the progress of each case.

Dispensary Service. The Health Service maintains a dispensary in Saucon Hall where students may receive free treatment for minor illnesses and injuries. The Dispensary hours are from 8.30 to 12.00 a.m. on all week days, from 1.30 to 5.00 p.m. on week days except Saturday, and from 10.00 to 12.00 a.m. on Sunday. A physican and a nurse are on duty in the dispensary during these hours. While the Health Service does not furnish medical attendance to students who are sick in their rooms, the Director keeps in touch with such cases by telephone and otherwise in so far as possible in order to see that the students are receiving proper attention and that the time lost from University work is minimized. It is requested that all such cases, together with the names of the attending physicians, be reported to the Director in order that complete records of the health of the students may be kept.

Education. A course in Personal and Social Hygiene is given to freshmen by the Director of the Health Service in conjunction with the Departments of Biology and Physical Education. In this course emphasis is laid on those points of personal hygiene most applicable to the student recently deprived of the atmosphere and influences of home. In social hygiene an effort is made to disseminate correct information concerning the history and present status of social diseases and the effectiveness of approved methods for the relief of existing conditions. This phase of the Health Service constitutes a specific part of the general program of instruction recommended by the State Board of Health and by other recognized organizations for the promotion of social hygiene.

BUREAU OF STUDENT EMPLOYMENT AND HOUSING

The Bureau of Student Employment and Housing is in charge of an officer of the University who is at all times at the service of students in matters pertaining to housing and remunerative employment while the University is in session.

LEHIGH UNIVERSITY UNION

The Lehigh University Union is a voluntary organization of students for the promotion of the religious, moral and social life of the University. The movement is distinctly for and by students, all the officers, with the exception of the General Secretary, being chosen from the student body. The office of the General Secretary is in Drown Memorial Hall.

THE LEHIGH UNIVERSITY BAND

The Band is required to participate in military ceremonies when called upon by the Professor of Military Science and Tactics, and also to attend all football games played at home and not more than ten other home games, to be specified by the Graduate Manager of Athletics.

Uniforms, musical instruments and music are furnished by the United States Government or by the University. A deposit of $25 is required for an instrument; students who own instruments are not required to make this deposit.

Seniors and juniors who qualify for membership in the Band may substitute band work for the requirement in Physical Education; sophomores and freshmen may substitute band work for the requirements in Physical Education and in Military Science and Tactics. Credit is not given during any term for both Band and either of the above named subjects. Students desiring to play in the Band as volunteers may do so, if qualified, and are entitled to the awards named in the following paragraph.

In addition to the above credits, one year of satisfactory service in the Band entitles a student to a watch fob; two years of service, a sweater; three years, $20 in cash; and four years, an additional $20 in cash. These awards are made only to those members of the Band who maintain at least sixty per cent. attendance each term at rehearsals, military ceremonies, and college activities.

BOARD OF CONTROL OF ATHLETICS

The management of intercollegiate athletics is vested in the Board of Control of Athletics, which consists of four members of the Faculty, four alumni elected by the Directors of the Alumni Association, and four undergraduates. The Graduate Manager is the executive officer of the Board.

The membership of the Board of Control of Athletics for the year 1927-1928 is as follows:

Faculty: Professors H. R. Reiter, F. V. Larkin, R. P. More, J. H. Ogburn.

Alumni: Messrs. W. R. Okeson, '96; D. M. Petty, '09; J. A. Frick, '03; M. L. Jacobs. '10.

Undergraduates: Messrs. W. B. Billmeyer, '28; W. W. Wiegand, '28; F. C. Schmid, Jr., '28; C. O. Carlson, '28.

The Graduate Manager of Athletics is J. G. Petrikin, '96.

HONORARY SCHOLARSHIP SOCIETIES

Phi Beta Kappa. Students in the College of Arts and Science and the College of Business Administration who up to the middle of the senior year maintain high scholarship may be elected to membership; also a limited number of engineering students whose work in philosophical, scientific and language studies is of high grade.

Tau Beta Pi. Students in the College of Engineering who up to the middle of the junior year maintain high scholarship may be elected to membership.

SOCIETIES OF THE COLLEGE OF ENGINEERING

An adjunct of value in promoting professional spirit in the College of Engineering is furnished by the departmental societies — voluntary organizations of students who meet monthly to present papers, to discuss engineering topics, and from time to time to hear addresses by invited engineers and scientists of note.

The first of these organizations historically was the Chemical Society, organized in 1871. In addition, the following national engineering societies have student branches at Lehigh University: the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Eletcrical Engineers, the American Institute of Mining and Metallurgical Engineers and the Society of Industrial Engineers.

OTHER ORGANIZATIONS

Other student organizations include:

The Arcadia (student self-governing body).
The Interfraternity Council.
Alpha Kappa Psi (professional business fraternity).
Pi Delta Epsilon (honorary journalistic fraternity).
Eta Kappa Nu (honorary electrical engineering fraternity).
Robert W. Blake Society (honorary, philosophy, psychology and education).
Alexander Hamilton Club (honorary, history and government).
Scabbard and Blade (honorary military society).
Omicron Delta Kappa (senior honorary society).
Cyanide Club (junior honorary society).
Phi Club (sophomore honorary society).
Scimitar (sophomore honorary society).
Sword and Crescent (senior honorary society).
The Combined Musical Clubs.
Mustard and Cheese (dramatic).
Deutscher Verein.
Club de Quinze (Romance languages).
The Radio Society.
Saint Paul's Society (Episcopalian).
National Collegiate Society of the Spiked Shoe.

The following Greek letter fraternities have chapters at Lehigh University: Alpha Chi Rho, Alpha Tau Omega, Beta Theta Pi, Chi Phi, Chi Psi, Delta Phi, Delta Tau Delta, Delta Upsilon, Kappa Alpha, Kappa Sigma, Lambda Chi Alpha, Phi Delta Pi, Phi Delta Theta, Phi Gamma Delta, Phi Sigma Delta, Phi Sigma Kappa, Pi Lambda Phi, Psi Upsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi, Sigma Phi Epsilon, Tau Delta Phi, Theta Delta Chi, Theta Kappa Phi, Theta Xi, Zeta Chi (local).

STUDENT PUBLICATIONS

The students of Lehigh University publish a semi-weekly college newspaper, *The Lehigh Brown and White;* a quarterly magazine, *The Lehigh Review;* a comic monthly, *The Lehigh Burr;* and a year-book, *The Epitome.*

FOUNDERS' DAY

The second Wednesday following the opening of the University in each year is celebrated as Founder's Day in honor of the Founder of the University, the Honorable Asa Packer. Degrees are conferred and Freshman and Sophomore Honors and Prizes are announced.

At the exercises on October 5, 1927, the forty-eighth Founder's Day, the address was entitled "Specialization and Co-operation in Scientific Research", by Karl Taylor Compton, Ph.B., M.S., D.Sc., Ph.D., Professor of Physics, Princeton University.

UNIVERSITY SUNDAY

The Sunday preceding University Day is known as University Sunday, and is devoted to the Baccalaureate Service. The Baccalaureate Sermon on June 5, 1927, was preached by the Rt. Rev. Philip Cook, S.T.D., D.D., Bishop of Delaware.

UNIVERSITY DAY

University Day marks the close of the collegiate year. On this day the graduation exercises are held, an address is given, senior honors and prizes are announced, and degrees are conferred.

The address at the exercises on June 14, 1927, was given by Michael Idvorsky Pupin, Sc.D., Ph.D., LL.D., Professor of Electro-Mechanics, Columbia University. The award of Commissions in the Officers' Reserve Corps was made by Major-General Douglas MacArthur, Commanding Third Corps Area, United States Army.

THE ALUMNI ASSOCIATION

The Alumni Association, which has been in existence since 1876, was incorporated in 1917 under the name The Alumni Association of the Lehigh University, Inc. The offices of the Association are in the Alumni Memorial Building. The Secretary is a permanent salaried officer. He edits the *Lehigh Alumni Bulletin*, a news publication issued monthly from October to July inclusive, and the *Alumni and Student List*. The Association is largely concerned with raising money to meet the needs of the University.

The officers and directors of the Alumni Association for 1927-1928 are:

President, F. R. Dravo, '89, of Pittsburgh, Pa.
Vice-President, Walton Forstall, '91, of Philadelphia, Pa.
Vice-President, William L. Estes, jr., '05, of Bethlehem, Pa.
Treasurer, R. S. Taylor, '95, of Bethlehem, Pa.
Secretary, Walter R. Okeson, '96, of Bethlehem, Pa.
Archivist, J. S. Long, '14, of Bethlehem, Pa.

Honorary Alumni Trustees: Aubrey Weymouth, '94, of New York, N. Y.; Alan C. Dodson, '00, of Bethlehem, Pa.; Henry D. Wilson, '01, of Pittsburgh, Pa.; H. H. McClintic, '88, of Pittsburgh, Pa.; Clarence W. Hudson, '89, of New York, N. Y.; and James W. Packard, '84, of Warren, O.

The following are the local alumni clubs: New York Lehigh Club, Philadelphia Lehigh Club, Pittsburgh Lehigh Club, Chicago Lehigh Club, Washington Lehigh Club, Detroit Lehigh Club, Northeastern Pennsylvania Lehigh Club (Scranton and Wilkes-Barre, Pa.), Maryland Lehigh Club (Baltimore, Md.), Lehigh Club of New England (Boston, Mass.), Lehigh Club of Central Pennsylvania (Harrisburg, Pa.), Lehigh Club of Northern New York (Schenectady, N. Y.), Lehigh Club of Northern Ohio (Cleveland, O.), Lehigh Club of Southern New England (Hartford, Conn.), Lehigh Club of Western New York (Buffalo, N. Y.), Southern Anthracite Lehigh Club (Pottsville, Pa.), Lehigh Home Club (Bethlehem, Pa.), Lehigh Club of China (Wuchang, China), Lehigh Club of Cuba (Havana, Cuba), Lehigh Club of Southeastern

Pennsylvania (Reading, Pa.), Lehigh Club of Trenton (N. J), Lehigh Club of York (Pa.), Lehigh Club of Northern New Jersey (Newark), Lehigh Club of Northern California (San Francisco).

HONORS AND PRIZES

Announced on University Day, June 14, 1927

Graduation Honors

GRADUATED WITH HIGH HONORS

Richard James Butz	Ch.E.	Allentown
Gilbert Vincent McGurl	Ch.E.	Minersville
Paul Gogel Strohl	C.E.	Cementon

GRADUATED WITH HONORS

Ralph William Baker	Ch.E.	Roanoke, Va.
Horace Yarnall Bassett, B.S.	E.M.	Coatesville
Lambert Edward Broad	B.A.	Nazareth
Fernando Aspurua-Caprilles	C.E.	Puerto Cabello, Venezuela
Renan Cetina	E.E.	Frontera, Mexico
Vito Angelo Concilio	B.A.	Newton, N.J.
Richard John DeGray	Ch.E.	Ramsey, N.J.
Paul Coughanour Ely	Met.	Monessen
Alvan LeRoy Henry	Bus.	Flemington, N.J.
Webster Sourber Jones	B.A.	Pottsville
Edward Earl Lake	Bus.	Perth Amboy, N.J.
Blaine Allen McCarty	B.A.	Pen Argyl
James Matthew Malloy	B.A.	Wilmington, Del.
John Henry Metz	E.E.	Scranton
Earl Russell Ottey	E.M.	Morton
Robert Edwin Peary, B.S.	C.E.	South Harpswell, Me.
Earl Hartman Schaub	B.A.	Freeland
Walter Edwin Schrader	C.E.	Bethlehem
Norman Harold Smeltzer	Bus.	Bellefonte
Norman Samuel Spatz	E.E.	Bernville
Alfred William Staller	E.E.	Pottsville
Elwood Stoddard	E.E.	Bangor

GRADUATED WITH SPECIAL HONORS

William Boyden Carns	(History)	Philadelphia
Alfred Augustus Fraser, Jr.	(History)	New York, N. Y.

Prizes

William H. Chandler Chemistry Prize, $25. To the highest ranking senior in the Curricula in Chemistry and Chemical Engineering
Gilbert Vincent McGurl, Minersville, Pa.

Electrical Engineering Prize, $25. For the best E.E. Thesis
Renan Cetina, Frontera, Mexico.

Metallurgical Engineering Prize, Senior Year, $50
Wilbur Edward Harvey, Catasauqua, Pa.

Freshman and Sophomore Honors, 1926–1927

Announced on Founder's Day, October 5, 1927

(Awarded to those members of the Classes of 1929 and 1930 who made an average grade of B or higher during the scholastic year 1926-1927.)

Freshman Honors

Reginald Collinson Barber	Eng.	Ketchikan, Alaska
Leonard Muhlenberg Bennetch	Eng.	Lebanon
Lee Calvin Boyer	Eng.	Shamokin
Alvin Jacob Frantz	Eng.	Allentown
Vaughn Haag	B.A.	Philadelphia
Lyle Laughlin Jones, Jr.	Eng.	Greensburg
Mearl Alton Kise	Eng.	Allentown
Franklin Haase Kissner	B.A.	Bethlehem
J. Leland Myer	Eng.	Leola
William George Ovens	Eng.	Endicott, N.Y.
Arthur Richard Pietzsch	Eng.	Philadelphia
William Ray Ritter	Eng.	Mechanicsburg
Alfred Nathan Rogers	Eng.	Reading
Henry Rohrs	Eng.	Ridgewood, N.J.
Francis Collins Scofield	Eng.	Lanham, Md.
Harold Walls Semar	Eng.	Philadelphia
Robert Serber	Eng.	Philadelphia
Arthur Levern Smith	Eng.	Coatesville
Albert Howard Zeigler	Eng.	Norristown
Harry John Zimmer	Eng.	Philadelphia

Sophomore Honors

Arthur Bryant Achilles	E.E.	West New Brighton, N.Y.
Philip Angeles, Jr.	B.A.	New York, N.Y.
Thomas Moran Brennan	Bus.	Rockville Centre, N.Y.
Michael Smyser Ebert	Ch.E.	Wilmington, Del.
Harold Charles Eschenlauer	Bus.	Woodcliff, N.J.
Samuel Garwood	Bus.	Medford, N.J.
Charles Willard Granacher	Bus.	Scranton
Robert Rowe Hertzler	Bus.	Lancaster
John Dale Kelly	Phys.,	Pelham Manor, N.Y.
John Irvine Kirkpatrick	Bus.	Woodhaven, N.Y.
John Alfred Lyter	Ch.E.	Harrisburg
Arthur Edward Magill	Bus.	Newark, N.J.
Planton Middleton	I.E.	Germantown
John Zollinger Miller	Ch.E.	Harrisburg
Charles Tilghman Oswald	Ch.E.	Fullerton
Curtis Frederick Prangley	E.E.	Washington, D.C.
Walter Henry Salzenberg	Ch.E.	Woodcliff, N.J.
Irving Hoos Schwab	B.A.	Bath
Kenneth Moore Simpson	Phys.,	Pottstown
Clarence Lichty Snavely	C.E.	Lancaster
Leon Knepper Sowers	E.E.	Hagerstown, Md.
Walter Scott Usher	Bus.	Union City, N.J.
Charles Edmunds Webbe	M.E.	Summit, N.J.
Herman Weintraub	B.A.	New York, N.Y.
August Wiesner, Jr.	B.A.	Bergenfield, N.J.
Horace Gotwalt Wiest	E.E.	York

Prizes, 1926–1927

Wilbur Prizes, Freshman Year

Mathematics, First Prize, $15

James Alexander Zipser, New York, N. Y.

Mathematics, Second Prize, $10

Francis Collins Scofield, Lanham, Md.

English, $15

Franklin Haase Kissner, Bethlehem, Pa.

German, $15

Thomas Joseph Conahan, Jr., Beaver Meadows, Pa.

French, $15
Franklin Haase Kissner, Bethlehem, Pa.

WILBUR PRIZES, SOPHOMORE YEAR

Mathematics, $10
Charles Edmunds Webbe, Summit, N. J.

English, $10
Raymond Philip Black, Newark, N. J.

Physics, $10
Michael Smyser Ebert, Wilmington, Del.

WILLIAMS PRIZES IN ENGLISH COMPOSITION, SOPHOMORE YEAR

First Semester, First Prizes, $10
Raymond Philip Black, Newark, N. J.
Jesse Ketchum Brennan, Jr., Michigan City, Ind.

First Semester, Second Prizes, $5
Laurence Justice Ackerman, Far Rockaway, N. Y.
Marvin Sidney Borowsky, Philadelphia, Pa.

Second Semester, First Prizes, $10
Marvin Sidney Borowsky, Philadelphia, Pa.
Arthur Parker Helms, Brooklyn, N. Y.

Second Semester, Second Prizes, $5
Philip Angeles, Jr., New York, N. Y.
Morris Heimerdinger, New York, N. Y.

WILLIAM H. CHANDLER CHEMISTRY PRIZES

Freshman Year, $25
Alvin Jacob Frantz, Allentown, Pa.

Sophomore Year, $25
Michael Smyser Ebert, Wilmington, Del.

Junior Year, $25
Edward William McGovern, Bethlehem, Pa.

METALLURGICAL ENGINEERING PRIZE, SOPHOMORE YEAR, $50
Charles Martin Schwitter, Montclair, N. J.

TAU BETA PI PRIZE (highest technical freshman)
ROBERT FRANKEL SERBER, Philadelphia, Pa.

ALUMNI PRIZES, JUNIOR YEAR

Metallurgical Engineering, $25
Peer Dudahl Nielson, Elyria, O.

Mining Engineering, $25
Frank Edwin Kuchinski, Minooka, Pa.

Wilbur Scholarship, $200 (for the best sophomore record)
John Irvine Kirkpatrick, Woodhaven, N. Y.

Phi Sigma Kappa Scholarship Cup (awarded for the year to the fraternity in the Interfraternity Conference having the highest scholarship record for the preceding year)
Lambda Chi Alpha Fraternity

DEGREES

Conferred on University Day, June 14, 1927

HONORARY DEGREES

DOCTOR OF ENGINEERING

Eugene Gifford Grace, E.E.	Bethlehem
Elmer Ambrose Sperry	Brooklyn, N.Y.

DOCTOR OF SCIENCE

William David Coolidge, B.S., Ph.D.	Schenectady, N.Y.

DEGREES IN COURSE

MASTER OF ARTS

Gertrude Gugatsch Lear, A.B. *(Cornell University)*	Bethlehem

MASTER OF SCIENCE

Nealy Adolphus Chapin, U.S.N. *(U. S. Naval Academy)*	Bethlehem
Byron Hall Hanlon, U.S.N. *(U. S. Naval Academy)*	Bethlehem
Nelson Sherk Hibshman, B.S. *(Pennsylvania State College)*	Bethlehem
James Dudley Ransom, Ch.E. *(Lehigh University)*	Jersey City, N.J.
Paul Christian Wetterau, Ch.E. *(Lehigh University)*	Bethlehem

BACHELOR OF ARTS

Edward Steindler Albright	New York, N.Y.
Lambert Edward Broad	Nazareth
Irving Broads	Yonkers, N.Y.

Harold Gordon Bushar	Pottsville
William Boyden Carns	Philadelphia
Milton Harvey Cohen	Lewistown
Clinton Samuel Comstock	Ridgewood, N.J.
Vito Angelo Concilio	Newton, N.J.
Frederick Tilghman Doll	Allentown
Alfred Augustus Fraser, Jr.	New York, N.Y.
Charles Rawson Fuller	Flushing, N.Y.
Frederick Albert Graa	New York, N.Y.
David Greenberg	Bethlehem
Herman Joseph Gutowitz	Amityville, N.Y.
John Boniface Hayes	New Britain, Conn.
Robert Purdy Hebard	New York, N.Y.
Dudley Allen Hoover	Buffalo, N.Y.
Webster Sourber Jones	Pottsville
William Bartle Kenworthey	East Orange, N.J.
John Henry Knebels	Bethlehem
Russell Peter Knerr	Allentown
Joseph Albert Longo	Bethlehem
Israel David Luria	Reading
Blaine Allen McCarty	Pen Argyl
Charles James William Magill, Jr.	Mount Royal, N.J.
James Matthew Malloy	Wilmington, Del.
Charles Herbert Nagel	Forest Hills, N.Y.
Reginald Shatswell Pitts	Hanover
Merritt Emmitt Randles	Ogdensburg, N.Y.
James Joseph Reed	Bethlehem
Milton Bernard Riskin	Bethlehem
James Baynard Roe	Sudlersville, Md.
Earl Hartman Schaub	Freeland
Nathan Keva Sheinfeld	New Haven, Conn.
Warren Smith Stoltz	Bronxville, N.Y.

BACHELOR OF SCIENCE

In Business Administration

Joseph Samuel Askin	Mount Vernon, N.Y.
Harold Fendrick Bester	Hagerstown, Md.
William Thomas Coombe	Bethlehem
Leonard Huguenor Couch	Buffalo, N.Y.
John Coventry Croxton	Cleveland, O.
George Edward Doty, Jr.	Peekskill, N.Y.

Mortimer Lazar Eckstein	Trenton, N.J.
William Ferdinand Feuerbach	Richmond Hill, N.Y.
Julian Jordan Frey	Baltimore, Md.
James Mitchell Gray	Middletown, N.Y.
John Leopold Hague	Oradell, N.J.
Elias Alexander Hamrah	Brooklyn, N.Y.
Alvan LeRoy Henry	Flemington, N.J.
John Middleton Holmes	New York, N.Y.
James Dunlop Johnson	Wingina, Va.
Paul Elmer Ketterer	Bethlehem
Irvine Johnston Kittinger, Jr.	Buffalo, N.Y.
Edward Louis Krone	Hackensack, N.J.
Edward Earl Lake	Perth Amboy, N.J.
Caesar Clinton Lear	Bethlehem
Walter John Lee	Westfield, N.J.
Lewis Robert Long	Bethlehem
Charles Edward McCombs	Bethlehem
Harry Turner Martindale, Jr.	Glen Ridge, N.J.
Kenneth Darraugh Matheson	Pittsburgh
Abraham David Medoff	Philadelphia
George Warren Pease	Ridgewood, N.J.
Bertel Neilson Peterson	Philadelphia
Charles Wilson Roberts, Jr.	Philadelphia
Thomas Robinson	Hackensack, N. J.
Louis Henry Sasse	New York, N.Y.
Leopold Marshall von Schilling, Jr.	Hampton, Va.
Frederick Willard Schmalz	Weehawken, N.J.
Albert Davenport Shonk	Kingston
Norman Harold Smeltzer	Bellefonte
Cedric Leland Smith	Wakefield, Mass.
Frederic Harlan Wilhelm	Bethlehem

CIVIL ENGINEER

William Walter Armstrong	Lisbon, O.
George Bachman, Jr.	Camden, N.J.
Fernando Aspurua-Caprilles	Puerto Cabello, Venezuela
Frank Andrew Carozza	Baltimore, Md.
Norman Richard Castor	Philadelphia
John William DeMoyer, Jr.	Camden, N.J.
William Easterbrook, Jr.	Philadelphia

Charles Booth Gessner	Toledo, O.
Wallace Randolph Hawkins	Gloucester, N.J.
George Frederici Kennedy	Lansford
Herbert Weymouth McCord	Flushing, N.Y.
Robert Edwin Peary, B.S. (*Bowdoin College*)	South Harpswell, Me.
Walter Edwin Schrader	Bethlehem
Paul Gogel Strohl	Cementon
Vincent Ignatius Varga	Bethlehem

INDUSTRIAL ENGINEER

Jouett Allen Chacey	Paterson, N.J.
Charles Keller Zug, Jr.	Philadelphia

MECHANICAL ENGINEER

Charles Elmer Barba, Jr.	Newton, Mass.
Ralph Loveland Bloor	Trenton, N.J.
Charles Wilbur Bowler	Glenside
John Shartle Brookover	Downingtown
Roland Bertram Case	Phillipsburg, N.J.
Herbert Cresswell	Scranton
John Bertram Diener	Hamburg
John Goldsborough Earle	Easton, Md.
Owen Davis Goodfellow	Coatesville
John Rowe Hertzler	Lancaster
Kenneth Francis Houseman	Plainfield, N.J.
Eugene Alvin Keller	Woxall
Elmer Joseph Kiefer, Jr.	Stroudsburg
Walter Benton Lair	Phillipsburg, N.J.
John Benjamin Laudig	Scranton
William Harry Lister	Rockville Centre, N.Y.
Robert William Marvin	Dalton
Carl Frank Norbeck	LaCrosse, Wis.
Kenneth Irvin Robinson	Millville, N.J.
Henry Hazen Sampson	Westfield, N.J.
Roland Martz Wetzel	Bethlehem

METALLURGICAL ENGINEER

Carl Louis Bittrich	Bethlehem
Ford Campney Brandon	Beaver Falls
Paul Coughanour Ely	Monessen
John Walter Gisriel, Jr.	Baltimore, Md.

Wilber Edward Harvey	Catasauqua
Carl Martin Schaub	Freeland
Emil Henry Spillman, Jr.	Catasauqua
Donald Nichlous Uebelhart	Canton, O.
Lorenz Henry Wilson	Bethlehem
Thomas James Wood	Palmerton

ENGINEER OF MINES

Horace Yarnell Bassett, B.S. (*Franklin and Marshall College*)	Coatesville
John Philip Cox	Levina, N.J.
John Simpson Ford	Tulsa, Okla.
Gerald Desmond Godshalk	Lansdale
Joseph Kalbach Goundie	Allentown
Herbert Greason Harmon	Ridgewood, N.J.
Robert Austin Harrier	LaCrosse, Wis.
Stanford Runyan Morris	Bristol
Earl Russell Ottey	Swarthmore
Samuel Scrivener	Washington, D.C.
Paul William Sinwell	Bethlehem

ELECTRICAL ENGINEER

Challis Britton	Scranton
Renan Cetina	Frontera, Mex.
John Lloyd Dancy	Phoenixville
Lawrence Joseph Heine	Bethlehem
Theodore Halsey Kemp	Glen Rock, N.J.
Lester Washington Leidy	New Hanover
George Emerson Loomis	Wilkes-Barre
John Henry Metz	Scranton
Joseph Anthony Nicholas	Dunmore
Milton Howard Osborn	Vineland, N.J.
Arthur Harrison Phillips	Wyomissing Hills
Jay Wilfred Picking	Somerset
Ira Elford Pierce	Peckville
James Henry Riefle, Jr.	Baltimore, Md.
Herbert Theodore Rights	Bethlehem
Raymond Arthur Shoup	Reading
Robert Sparks	Far Rocakway, N.Y.
Norman Samuel Spatz	Bernville
Alfred William Staller	Pottsville
Elwood Stoddard	Bangor

Charles Norton Wagner	Norristown
Thomas Joseph Wright	Bethlehem
Charles Keller Zug, Jr.	Philadelphia

CHEMICAL ENGINEER

Ralph William Baker	Roanoke, Va.
Rong Binai	Washington, D.C.
Fred Augustus Brill, Jr.	Swarthmore
Carlton Ernest Brown	Washington, D.C.
Harry Arthur Brown	Lebanon
Richard James Butz	Allentown
Joseph Donald Cottrell	Takoma Park, D.C.
Richard John DeGray	Ramsey, N.J.
Edward Maynard Giles	Paterson, N.J.
Hugh Clifford Jones	Wilkes-Barre
William Walton Kittelberger	Curwensville
Norman Louis Krey	Washington, D.C.
Gilbert Vincent McGurl	Minersville
Arthur Albert Molitor	Swedesboro, N.J.
Forest Edwin Phillips	Bethlehem
William Price Rankin	Phoenixville
William Vinton Rathbone	Parkersburg, W.Va.
John Gordon Ridsdale	Washington, D.C.
Erich Karl Zimmermann	Passaic, N.J.

BACHELOR OF SCIENCE

In Engineering Physics

Malcolm Kenneth Gordon, Jr.	Lake Wales, Fla.

COMMISSIONS AS SECOND LIEUTENANT IN THE OFFICERS' RESERVE CORPS

Infantry

James Elmer Bevan	Frackville
Carlton Ernest Brown	Washington, D.C.
Richard James Butz	Allentown
Jouett Allen Chacey	Paterson, N.J.
William Thomas Coombe	Bethlehem
Frederick Mertz Fisher	Wyomissing
Wallace Randolph Hawkins	Gloucester, N.J.
John Boniface Hayes	New Britain, Conn.
Herman John Henke	Honesdale

John Rowe Hertzler	Lancaster
Paul Elmer Ketterer	Bethlehem
Norman Louis Krey	Washington, D.C.
Edward Earl Lake	Perth Amboy, N.J.
Robert Louis Longstreet	Asbury Park, N.J.
Charles Edward McCombs	Bethlehem
William Edward Martin, Jr.	Bethlehem
Jay Wilfred Picking	Somerset
Eugene Lyons Rerig	Hazleton
John Gordon Ridsdale	Washington, D.C.
Cedric Leland Smith	Wakefield, Mass.
Paul Gogel Strohl	Cementon
Albert Hanson Trumbull	New York, N.Y.
Charles Faust Walborn	Wilkes-Barre
William Foster Wilmurt	New Rochelle, N.Y.

Ordnance

George William Beckman	Hellertown
Rudolph Myers Bush	Washington, D.C.
Paul Coughanour Ely	Monessen
Kenneth Irvin Robinson	Millville, N.J.
Norman Samuel Spatz	Bernville
Nathan Irving Tyler	Ridgewood, N.J.

CERTIFICATES OF ELIGIBILITY FOR COMMISSIONS AS SECOND LIEUTENANTS IN THE OFFICERS' RESERVE CORPS

(Commissions withheld because of the candidates' being under age)

Richard John De Gray	Ramsey, N.J.
Frederick Willard Schmalz	Weehawken, N.J.
Norman Harold Smeltzer	Bellefonte

Degrees conferred on Founder's Day, October 5, 1927

HONORARY DEGREE

DOCTOR OF SCIENCE

Karl Taylor Compton, Ph.D., M.S., D.Sc., Ph.D.	Princeton, N.J.

DOCTOR OF ENGINEERING

Robert Culbertson Hays Heck, M.E.	New Brunswick, N.J.

DEGREES IN COURSE

MASTER OF ARTS

Earl Haines Brown, B.S. (*Pennsylvania State College*)	Slatington

BACHELOR OF ARTS

George Justus Kuck	Forest Hills, N.Y.
Robert Louis Longstreet	Asbury Park, N.J.
George Henry Toadvine	Williamsport
Mitchell Walter VanBilliard	Bethlehem
William Foster Wilmurt	New Rochelle, N.Y.

BACHELOR OF SCIENCE

In Business Administration

Marshall Hanford Foote	South Norwalk, Conn.
Stephen Sheldon Groner	Syracuse, N.Y.
Stanley Arthur Kitzinger	Yonkers, N.Y.
William Edward Martin, Jr.	Bethlehem
Harry Bachman Miller	Bethlehem
Ralph Calvert Moore	Berkeley, Cal.
Neil Joseph Sullivan	Germantown

CIVIL ENGINEER

Roger Light Miller	Lebanon
Herbert Lloyd Phyfe	New York, N.Y.
Charles Shoemaker Satterthwait	Lansdowne

MECHANICAL ENGINEER

John Hope Sloan Barr	Wayne
Rudolph Myers Bush	Washington, D.C.
Robert Duncan Cheel	Ridgewood, N.J.
David Lobo	Caracas, Venezuela
John Bishop Schroeffel	Bethlehem

ENGINEER OF MINES

Luis Francisco Guerrero	Cucuta, Colombia

ELECTRICAL ENGINEER

Paul Daniel Eisenbrown	Reading
Frank Eugene Jedlicka	Baltimore, Md.
César Dárdanos Tijerino	Brooklyn, N.Y.

CHEMICAL ENGINEER

John Wesley Waldron	Philadelphia

STUDENTS, 1927–1928

GRADUATE STUDENTS

Name	*Candidate for*	*Residence*
Allam, LeRoy Sterner, B.A. (*Moravian College*)	M.A.	Bethlehem
Andrew, Willis R., A.B., A.M. (*Albright College, University of Pennsylvania*)		Bethlehem
Bachert, Orrin William, B.S. (*Muhlenberg College*)	M.S.	Bethlehem
Bachman, Mildred Hoffman, B.A. (*Tusculum College*)	M.A.	Bethlehem
Bailey, Wayland Solon, S.B. (*Massachusetts Institute of Technology*)	M.S.	Bethlehem
Barnes, Leland Spencer, B.A. (*Occidental College*)	M.A.	Bethlehem
Beers, Stanley Stephen, B.S. (*Temple University*)	M.S.	Walnutport
Brown, Carlton Ernest, Ch.E. (*Lehigh University*)	M.S.	Washington, D.C.
Cook, Nevin John, B.A. (*Lehigh University*)	M.A.	Bethlehem
Couch, Walter Roberts, C.E., M.S. (*Akron University, Akron University*)	M.S.	Salem, Mass.
DeGray, Richard John, Ch.E. (*Lehigh University*)	M.S.	Ramsey, N.J.
Dwyer, Mary Margaret, B.S. (*Moravian College for Women*)	M.A.	Bethlehem
Egge, Walter Serinus, B.S. (*North Dakota State Agricultural College*)	M.S.	Moorhead, Minn.
Eisenhard, John Luther, B.A. (*Muhlenberg College*)	M.A.	Topton
Faust, Irving Crowell, B.A., B.D. (*Pennsylvania State College, Lancaster Theological Seminary*)	M.S.	Bethlehem
Fehr, Howard Franklin, B.A. (*Lehigh University*)	M.S.	Irvington, N.J.

Friend, Halton Hobson, B.S. (*Northwestern University*)	M.S.	Sand Springs, Okla.
Getchell, Williams Bassett, Jr., B.S. (*University of Maine*)	M.S.	Augusta, Me.
Gjesdahl, Maurice Sven, B.S. (*University of Minnesota*)	M.S.	Bethlehem
Heath, Donald Austin, E.M. (*Lehigh University*)		Jersey City, N.J.
Hollenbach, Aral Miles, B.S. (*Muhlenberg College*)	M.S.	Allentown
Hunter, Jeannette, A.B., Ph.B. (*Cedar Crest College, Muhlenberg College*)	M.S.	Wyomissing
Jennings, Burgess Hill, B.Eng. (*Johns Hopkins University*)	M.S.	Baltimore, Md.
Jensen, Cyril Dewey, B.S. (*University of Minnesota*)	M.S.	Bethlehem
Jones, Hugh Clifford, Ch.E. (*Lehigh University*)	M.S.	Wilkes-Barre
Kichline, William Levi, B.A. (*Lehigh University*)	M.S.	Bethlehem
King, John Aubrey, B.S. (*University of Texas*)	M.S.	Bethlehem
Kistler, Ruth Moser, A.B. (*Ursinus College*)	M.A.	Allentown
Kittelberger, William Walton, Ch.E. (*Lehigh University*)	M.S.	Curwensville
Lorsbach, Elizabeth Mary, Ph.B. (*Muhlenberg College*)	M.A.	Allentown
Messersmith, Harry Edgar, A.B., A.M. (*Albright College, Albright College*)	M.A.	Allentown
Miller, Ruth Meredith, B.A. (*Bryn Mawr College*)	M.S.	Bethlehem
Minner, Fred Henry, B.S. (*Muhlenberg College*)	M.S.	Allentown
Mohr, Robert Landis, B.S. (*Juniata College*)	M.A.	Coopersburg

Morris, Robert Beverly, B.S. *(North Carolina State College)*	M.S.	Asheville, N.C.
Nevins, Samuel Craig, Ch.E. *(Lehigh University)*	M.S.	Tamaqua
Richardson, Edward Adams, S.B., B.S. *(Massachusetts Institute of Technology, Harvard University)*	M.S.	Bethlehem
Schlingman, Paul Frank, B.S. *(University of Illinois)*	M.S.	Schenectady, N.Y.
Scott, Frederick Allen, B.S. *(New York State College)*	M.S.	Roslyn Heights, N.Y.
Sette, William Joseph, B.S. *(Yale University)*	M.S.	New Haven, Conn.
Simmons, Charles Wellington, B.S.C. *(Queen's University)*	M.S.	Kingston, Ont., Canada
Sproull, Wayne Treber, B.S. *(University of Akron)*	M.S.	Akron, O.
Sung, Wen Tian, M.S. *(Purdue University)*	M.S.	Shantung, China
Thompson, John Murray, A.B. *(DePauw University)*	M.A.	Kokomo, Ind.
Thorpe, Melvin Alexander, B.Chem. *(William and Mary College)*	M.S.	Williamsburg, Va.
Whitenight, Harold Philip, B.S. *(Muhlenberg College)*	M.S.	Allentown
Wilson, Muriel Louise, A.B. *(Moravian College for Women)*	M.A.	Bethlehem
Zimmerman, Erich Karl, Ch.E. *(Lehigh University)*	M.S.	Passaic, N.J.

UNDERGRADUATES

Arts—Arts and Science
Bus.—Business Administration
Ch.E.—Chemical Engineering
Chem.—Chemistry
C.E.—Civil Engineering
E.E.—Electrical Engineering
E.M.—Mining Engineering
Eng.—Freshman Engineering
I.E.—Industrial Engineering
M.E.—Mechanical Engineering
Met.—Metallurgical Engineering
Phys.—Engineering Physics

Aaron, Harry Clement	Eng.,'31	Cresskill, N.J.
Abrams, Harry Francis	Bus.,'31	Grantwood, N.J.
Abrom, Isidore	Arts,'28	Bethlehem
Accardi, Alessio John	C.E.,'29	Wildwood, N.J.
Achilles, Arthur Bryant	E.E.,'29	West New Brighton, N.Y.
Ackerman, Cleon Cleveland	Eng.,'31	Lancaster
Ackerman, Lawrence Justin	Arts,'29	Far Rockaway, N.Y.
Adams, Henry Mason	Arts,'30	Fall River, Mass.
Adams, Stanley Benning	Met.,'30	Saginaw, Mich.
Adams, William Brackenridge	E.M.,'29	Crafton
Ahlberg, John Karsten	Arts,'29	Brooklyn, N.Y.
Aitken, Donald Guthrie	Arts,'29	Orange, N.J.
Albert, Philip Ernest	Bus.,'31	Trenton, N.J.
Albright, Ralph John	C.E.,'29	Allentown
Alcorn, William Gaston	Arts,'31	Bethlehem
Alder, Robert, Jr.	Bus.,'30	Woodcliff, N.J.
Aldridge, David Holden	Bus.,'31	Rome, N.Y.
Alexander, David Bank	Arts,'28	Allentown
Alexander, Reginald Frank	Bus.,'30	Washington, D.C.
Allison, Arthur James Brooks	Eng.,'31	Windsor, Conn.
Allison, Samuel Deane	Bus.,'31	Windsor, Conn.
Alter, Charles Sidney	I.E.,'29	Pottsville
Althouse, Raymond Richard	C.E.,'28	Philadelphia
Altieri, Francis Richard	Arts,'31	Waterbury, Conn.
Altland, Frederick Henry	Eng.,'31	Abbottstown
Alwine, Harry Spangler	Arts,'28	Spring Grove
Ames, Charles Savage	Arts,'28	Hazleton
Anamisakis, Anthony Fotis	Bus.,'31	Bethlehem
Anderson, John Buchanan Robinson	Eng.,'31	New York, N.Y.
Anderson, Robert Lee	Ch.E.,'30	Worcester

Andrew, Albert Emerson	Bus.,'30	Bethlehem
Andrews, Clinton Leslie	Eng.,'31	Easton
Andrews, Harry, Jr.	Eng.,'31	Walnutport
Angeles, Philip, Jr.	Arts,'29	Astoria, N.Y.
Angster, Edward Casper	Eng.,'31	Newark, N.J.
Arnold, Edward Freeman	Bus.,'28	Mount Vernon, O.
Arnold, Edwin Brown	Arts,'29	Zanesville, O.
Ash, Charles Elwood, Jr.	M.E.,'29	Kingston
Atkins, David Bright	I.E.,'30	Pottsville
Austin, Charles Augustus, II	Bus.,'31	Elmira, N.Y.
Auten, John Hawkins	C.E.,'29	Corbett, Md.
Ayre, Thomas, Jr.	Eng.,'31	Miner's Mills
Bace, Vytold Anthony	M.E.,'29	Hoboken, N.J.
Bachman, Charles Russell	E.E.,'30	Upper Montclair, N.J.
Bachtell, Edward Maxwell	Bus.,'29	Hagerstown, Md.
Badgley, William Gervaise, Jr.	I.E.,'30	Chatham, N.J.
Bahr, Paul Albert	E.E.,'30	Scranton
Baird, Robert Ligget	Eng.,'31	Lansdowne
Baker, Edward Folsom	Arts,'29	Buffalo, N.Y.
Baker, Harold Jay, Jr.	E.M.,'30	Tulsa, Okla.
Baker, Hyman	Ch.E.,'29	Wildwood, N.J.
Baker, Robert Alt	E.E.,'30	Reading
Baldree, Aaron Burr	Arts,'29	Melber, Ky.
Banks, Carl Washington	Eng.,'31	Pottsville
Barber, Reginald Collinson	I.E.,'30	Ketchikan, Alaska.
Barker, Frederick Simon	I.E.,'30	Bridgeton, N.J.
Barnard, Job	Arts,'31	Washington, D.C.
Barnard, John Edward	Bus.,'29	Meriden, Conn.
Barnes, Gared Clemens Landes	Bus.,'30	Haddonfield, N.J.
Barnes, Horace Allan	C.E.,'29	Philadelphia
Barnhard, Emil George	Bus.,'29	Girardville
Barnitz, Edward Switzer	Ch.E.,'28	Salem, Va.
Barrows, Daniel Joseph	C.E.,'30	New York, N.Y.
Barthold, Ralph Waldo	Arts,'30	Bethlehem
Bartoo, Elfred Garrett	C.E.,'28	Ridgewood, N.J.
Bateman, William Henry	Bus.,'31	Philadelphia
Bauer, Charles Henry, Jr.	C.E.,'30	East Orange, N.J.
Bauman, Paul Albert	Bus.,'28	Danville
Baur, Albert Campbell	Eng.,'31	Bethlehem
Baver, Clyde Byron	M.E.,'28	Shoemakersville

Baver, Mark Noah	Bus.,'30	Shoemakersville
Beachler, Harold Ray	Eng.,'31	Pittsburgh
Beal, Alexander Simpson	Arts,'31	Brookline, Mass.
Bean, Henry Detwiler	C.E.,'30	Skippack
Beard, Wilfred George	Eng.,'31	Mount Kisco, N.Y.
Beasley, Revere	Arts,'30	Glen Ridge, N.J.
Beauchamp, James Henry	Bus.,'28	Bethlehem
Beck, John Emery	M.E.,'28	Bethlehem
Beck, Lewis Carl	Bus.,'29	New Haven, Conn.
Beckel, Ralph Levering	Met.,'30	Bethlehem
Becker, Lewis William, Jr.	Ch.E.,'29	Trenton, N.J.
Becker, Stephen Pierce	Bus.,'29	Poughkeepsie, N.Y.
Beckman, George William	C.E.,'28	Hellertown
Beebe, Ernest Dubbs	Eng.,'31	Allentown
Beer, Norman Frank	Bus.,'29	Red Bank, N.J.
Behr, Henry Hobart	Bus.,'29	Montclair, N.J.
Bellringer, Herbert Hext	Bus.,'30	Hollis, N.Y.
Belmore, Albert Joseph	Eng.,'31	Schuyler, Va.
Bender, Luther Huyett	E.E.,'29	Wernersville
Bender, Maurice Edwin	C.E.,'28	Harrisburg
Benedict, John Downey	Eng.,'31	Waynesboro
Benner, Roland George	Ch.E.,'29	Quakertown
Bennetch, Leonard Muhlenberg	Ch.E.,'30	Lebanon
Bennett, John Doane	Eng.,'31	Worcester, Mass.
Bennett, Robert Sherman	Bus.,'30	East Orange, N.J.
Bennett, Warren Henry	Arts,'30	Rockville Centre, N.Y.
Bent, Joseph Grant, Jr.	E.E.,'28	Baltimore, Md.
Benton, Forest Theodore, Jr.	Ch.E.,'29	Somerville, Mass.
Berger, Vincent Paul	Eng.,'31	Aberdeen Proving Ground, Md.
Berlin, Franklin Dale	Bus.,'31	Slatington
Berman, Ben Samuel	Bus.,'28	Reading
Berman, Charles Philip	Arts,'28	Newark, N.J.
Betterly, John Austin	C.E.,'28	Scranton
Biddison, Douglass Rowland	E.E.,'30	Baltimore, Md.
Billman, Leroy Stanley	Eng.,'31	Landisburg
Billmeyer, William Brown, Jr.	Arts,'28	York
Bingamon, Llewellyn Reynold	Arts,'31	Reading
Bisbee, James McVey	Eng.,'31	Susquehanna

Bishop, Charles Justus	Arts,'31	Scranton
Bittrick, Norbert Martin	Arts,'28	Bethlehem
Black, Raymond Philip	Arts,'30	Newark, N.J.
Blackmar, John Milton	Bus.,'30	East Orange, N.J.
Blackmar, William Edgar	Bus.,'30	East Orange, N.J.
Blair, Robert Irving	Arts.,'30	River Edge, N.J.
Blanchard, Edward Marvin	Arts.,'29	Brooklyn, N.Y.
Bloodsworth, Harry, Jr.	Eng.,'31	Lansdowne
Bloom, Louis Morris	E.E.,'30	Philadelphia
Blumberg, Herbert Chester	Bus.,'31	Reading
Blumenthal, Alexander	Arts,'30	Brooklyn, N.Y.
Blythe, Arthur James	Arts,'29	Clark's Summit
Bodalski, Felix Joseph	Arts,'29	Nanticoke
Bogerman, Frank Carter	Ch.E.,'28	Paterson, N.J.
Bohner, John Allen	E.E.,'30	Catasauqua
Boies, Clayton Sumner, Jr.	Bus.,'30	Seymour, Conn.
Bollek, Stephen Vincent	Bus.,'31	Bethlehem
Bollman, Michael Joseph	E.M.,'29	Lebanon
Bolton, Jack Kemble	C.E.,'28	York
Boltz, Jay Harold	Eng.,'31	Lebanon
Bond, Charles Vernon	Eng.,'31	Coral Gables, Fla.
Booker, William Patterson	E.E.,'28	Portsmouth, O.
Boosin, Zachary	Arts,'30	New York, N.Y.
Borowsky, Marvin Sidney	Arts,'29	Philadelphia
Bower, Donald Langlitz	M.E.,'30	Harrisburg
Boyd, James Daskin, Jr.	Eng.,'31	Bayonne, N.J.
Boyer, Harry Jeremiah	Eng.,'31	Egypt
Boyer, Lee Calvin	C.E.,'30	Shamokin
Boynton, Charles Dmitrenko	Bus.,'30	New York, N.Y.
Brader, James Clarence	Arts,'31	Nanticoke
Bradin, John Percy, Jr.	Arts,'31	Elizabeth, N.J.
Bradley, Redford Gulick	Arts,'30	New Brunswick, N.J.
Brady, Charles Ignatius, Jr.	E.E.,'28	Brooklyn, N.Y.
Brady, Joseph Skeath, Jr.	Ch.E.,'30	Bayonne, N.J.
Brady, William Young, Jr.	Bus.,'31	Washington, D.C.
Bramble, John Howard	E.E.,'28	Baltimore, Md.
Brandt, Daniel Bailey	Bus.,'31	Harrisburg
Bratton, Robert John	Bus.,'31	Stamford, Conn.
Braun, Robert Carl	Eng.,'31	Reading
Brennan, Thomas Moran	Bus.,'29	Rockville Centre, N.Y.

Brettner, Louis Allen	Arts,'30	Allentown
Brew, Thomas Hamilton, Jr.	Arts,'31	Lansford
Brewer, John Gilmore	Bus.,'31	Pittsburgh
Brick, Robert Maynard	Met.,'29	Atlantic City, N.J.
Briggs, Milton Alver	C.E.,'30	Bradley Beach, N.J.
Bronstein, Jesse Bayliss, Jr.	Arts.,'30	Allentown
Brosz, Paul Albert	C.E.,'30	Philadelphia
Brotzman, Edward Stephen	E.E.,'30	Easton
Brower, Meyer	Bus.,'30	Newark, N.J.
Brower, Theron Emmett	E.E.,'29	Little Silver, N.J.
Brown, George Eliot	Eng.,'31	Bayonne, N.J.
Brown, Jack Baldwin	Bus.,'30	Scranton
Brown, John Douglas	E.E.,'30	Reading
Browne, Martin Lawrence	Arts,'28	Ronkonkoma, N.Y.
Bruning, Louis Frank	Bus.,'29	Greensburg
Buck, Charles Abner	Arts,'29	Bethlehem
Buck, Louis Augustine	Arts.,'30	Bethlehem
Buck, Walter Stephen	Bus.,'28	Bethlehem
Budd, Hulse	E.E.,'30	Budd Lake, N.J.
Bullard, Dexter	C.E.,'30	Kew Gardens, N.Y.
Burbank, David Redman, Jr.	Bus.,'31	Ridgewood N.J.
Burger, Dallas Osville	Phys.,'30	Allentown
Burke, Donald Provan	Bus.,'30	Philadelphia
Burke, Joseph James	Eng.,'31	Plymouth
Burke, Thomas Francis, Jr.	Arts.,'28	Pittston
Burkhart, Louis Hoddle, Jr.	M.E.,'29	Warren
Burns, Hugh Francis	Ch.E.,'30	Catasauqua
Burns, Roy Herman	E.E.,'30	Harrisburg
Burt, Charles Johnson	Bus.,'31	Woodcliff, N.J.
Busch, Herbert Hertgen	Bus.,'31	Newark, N.J.
Bushnell, John Charles	Bus.,'31	Carnegie
Butler, Clarence Staunton	Eng.,'31	Philadelphia
Byrnes, Russell	Arts,'28	Ardmore
Calder, George Cliff	C.E.,'30	Lancaster
Callan, Thomas John	Arts,'31	Flushing, N.Y.
Calleja, Jose Raphael	Arts,'31	Cartego, Costa Rica
Camden, Graham Blackford	Eng.,'31	Parkersburg, W.Va.
Campbell, James Rue	E.E.,'30	Long Branch, N.J.
Campbell, William	Ch.E.,'28	Fullerton
Canfield, Edward	Bus.,'31	Middletown, N.Y.

Cannan, Roland	Arts,'30	Philadelphia
Canning, Robert Ashton	C.E.,'28	Bethlehem
Carey, Dean	Bus.,'31	Kingston
Carlin, Max	Arts,'31	Brooklyn, N.Y.
Carlson, Carl Oscar	Bus.,'28	Grantwood, N.J.
Carlson, Harry Walter	Arts,'29	Ridgway
Carr, Robert Franklin	Eng.,'31	Monongahela
Case, Samuel	C.E.,'28	Flemington, N.J.
Caskey, Joseph Ralph	Arts,'29	Philadelphia
Cassone, Vincent James	Arts,'29	Allentown
Castellano, Nicholas Illaria	Arts,'31	Newark, N.J.
Castiello, Joseph Ferdinand	Arts.,'31	Bethlehem
Castle, Jesse Greenman	Bus.,'28	Lockport, N.Y.
Castles, Hugh Witherow	I.E.,'30	Mechanicsburg
Cerf, Ernest Eugene	Arts,'31	Flushing, N.Y.
Chaffee, Louis Lentz	Bus.,'31	Grand Rapids, Mich.
Chamberlin, Thornton Earl	Bus.,'30	Buffalo, N. Y.
Chandler, Thompson	Ch.E.,'29	New York, N.Y.
Chapman, Richard Douglass	I.E.,'30	Jenkintown
Chase, Curtis Alden	Eng.,'31	Danbury, Conn.
Cherry, Franklin Willard	M.E.,'29	Ringtown
Chess, Robert Sterrett, Jr.	Bus.,'31	Pittsburgh
Chickering, Kenton	Bus.,'28	Oil City
Christman, Carl Mertz	C.E.,'28	Sinking Springs
Christman, Miles Shelly	M.E.,'30	Trumbauersville
Ciastkewicz, Arthur Joseph	Eng.,'31	Hackettstown, N.J.
Cigol, Everett Colby	Bus.,'28	Paterson, N.J.
Citron, Millard Herman	Bus.,'30	White Plains, N.Y.
Ciulla, Thomas	Arts,'31	Brooklyn, N.Y.
Clark, William Sargeant	Bus.,'31	Springfield, Mass.
Clarke, Alexander Helverson, Jr.	Arts.,'28	Trenton, N.J.
Clarke, Davison Randolph, III	Ch.E.,'28	Freemansburg
Clarke, Dumont	Eng.,'31	Tenafly, N.J.
Class, Charles Frank, Jr.	C.E.,'28	Harrisburg
Claus, Carl, Jr.	Eng.,'31	Plainfield, N.J.
Clayton, Francis LeRoy	Bus.,'28	Joplin, Mo.
Cleaveland, Charles Horace	Bus.,'31	Bethlehem
Clegg, William James	Bus.,'31	Pittsburgh
Cleveland, George Thomas Edwin	Arts,'29	New London, Conn.

Clifton, Merritt Robert	Bus.,'30	Baltimore, Md.
Clinger, Arthur William	Bus.,'29	Oil City
Clinger, Henry Robert, Jr.	Ch.E.,'29	Tilton
Clocker, Edwin Thompson	Eng.,'31	St. Clair
Coates, Stephen Paul	Arts,'29	Brooklyn, N.Y.
Cochran, Joseph William	Bus.,'30	Williamsport
Coe, Arthur Hill	Bus.,'31	South Orange, N.J.
Cohen, Albert	Arts,'31	Brooklyn, N.Y.
Cohn, Leslie McKinley	Arts,'31	New York, N.Y.
Colby, Henry Gillette	I.E.,'30	Buffalo, N.Y.
Colclough, Joseph Guy	Bus.,'29	Catasauqua
Collins, James Vallance	Bus.,'30	Rome, N.Y.
Collins, William Middleton	Bus.,'31	Saranac Lake, N.Y
Colver, William Henry, Jr.	Bus.,'28	Speeceville
Comins, Harrison Durgin	Eng.,'31	Vineland, N.J.
Conahan, Thomas Joseph, Jr.	Arts,'30	Beaver Meadow
Condit, Stephen Hobart	Bus.,'31	Troy Hills, N.J.
Conneen, John Kearney	C.E.,'30	Maplewood, N.J.
Connell, Valentine Barker	Arts,'30	Audubon, N.J.
Connor, William Eugene	E.E.,'28	Wilkes-Barre
Conrath, Joseph George	C.E.,'29	Erie
Converse, Curtis Vaughn	Bus.,'29	Athens
Cooper, Ellsworth George	Eng.,'31	Coopersburg
Cooper, Frank Edward	Bus.,'28	Shamokin
Cooper, George Mullen	E.E.,'30	Sewickley
Cooper, William Charles	Arts,'28	Shamokin
Cope, Samuel Frederick	Bus.,'31	Bethlehem
Corcoran, Gerald Aloysius	E.M.,'30	Scranton
Coroniti, Samuel Charles	E.E.,'30	Marion Heights
Covert, John Addison	C.E.,'28	Philadelphia
Covey, John Knox	C.E.,'28	Coudersport
Coxe, Thomas Herbert Carey	C.E.,'28	Bethlehem
Craft, Edmund Coleman	Bus.,'28	Pennington, N.J.
Crandall, William Montague	Eng.,'31	Cambridge Springs
Crawford, John Humphrey, Jr.	I.E.,'29	Orange, N.J.
Crego, Byron Edward	Bus.,'31	Harrisburg
Cresswell, Ernest Jesse	Eng.,'31	Scranton
Crewe, Leonard Carter, Jr.	Met.,'29	Gary, Ind.
Crolius, Lawrence	I.E.,'30	Bellevue
Cross, George Howard, Jr.	Bus.,'30	Chester

Culbertson, John Harrison	E.E.,'30	Lansdowne
Cunningham, David Schreiber	E.M.,'28	Ben Avon
Cuntz, William Cooper	Met.,'30	Kew Gardens, N.Y.
Curtin, John, Jr.	I.E.,'30	Bellefonte
Cushing, John Dewey	Eng.,'31	Stamford, Conn
Cushman, Hall Watson	Eng.,'31	Bayside, N.Y.
Cyphers, Elmer Benjamin	Eng.,'31	Bethlehem
Dailey, John Woodward	M.E.,'30	Philadelphia
Daley, Kenneth Dexter	Bus.,'31	Cleveland, O.
Daly, Marcus John	Bus.,'31	New York, N.Y.
Damiani, Philip Gerald	Bus.,'29	Philadelphia
Dancy, Horace Lloyd	Bus.,'30	Phoenixville
Danko, Joseph Thomas	E.E.,'30	McKeesport
Darrall, Jack Barrington	Arts,'31	Kittanning
Datwyler, Howard Edward	C.E.,'30	Flushing, N.Y.
Davey, John Roderick	Met.,'30	Mansfield, O.
Davidowitz, Arthur Maxwell	Arts,'30	Scranton
Davidson, Herbert Coolidge, Jr.	Eng.,'31	Montclair, N.J.
Davis, Alfred Jeremy	Bus.,'30	Scranton
Davis, Benjamin Miller	Eng.,'31	Freeland
Davis, Donald Edward	Bus.,'31	Allentown
Davis, Edward Russell	Arts,'30	Collingswood, N.J.
Davis, Melvin Edmund	Arts,'30	New London, Conn.
Davis, Moses	E.E.,'29	Scranton
Davis, Philip Smyser	Eng.,'31	Lebanon
Davis, Ralph Claire	Bus.,'30	St. Petersburg, Fla.
Davis, Robert Rhodes	Bus.,'29	Clarksburg, W.Va.
Dean, John Clark, Jr.	Ch.E.,'30	Bethlehem
DeBerardinis, Vincent Anthony	Eng.,'31	Chester
Dechnik, Andrew	Arts,'31	Bethlehem
Deckard, Ralph Herman	E.E.,'30	Marysville
Decker, Ralph William	Arts.,'31	Arlington, N.J.
Decker, Robert Benjamin	Bus.,'31	Elizabeth, N.J.
Dehm, Ernest William	Bus.,'30	New Britain, Conn.
DeHuff, Gilbert Lafayette, Jr.	E.M.,'30	Millville, N.J.
Deichler, Frank Leaman, Jr.	C.E.,'28	Upper Darby
Deichler, John Kendig	C.E.,'30	Upper Darby
Deitzler, Clyde Donald	Bus.,'29	Lebanon

Delaplaine, Aubrey Cresson, Jr.	Arts.,'29	Cynwyd
Deluhery, Lawrence Brenton	Eng.,'31	Buffalo, N.Y.
DeMattia, Lawrence	M.E.,'30	Passaic, N.J.
DeMoyer, Robert	C.E.,'29	Camden, N.J.
Dempsey, John Joseph	Bus.,'31	Bethlehem
Denise, John Robbins	I.E.,'28	Oakmont
Derrico, Charles	Arts,'31	New York, N.Y.
Derrico, Nicholas	Arts,'30	New York, N.Y.
DeVilbiss, Thomas Edward	Eng.,'31	Columbus, O.
Dey, John Stanley	Bus.,'30	Newark, N.J.
Dickerson, Julian Douglas	Met.,'30	Washington, D.C.
Diehl, Stanley Clinton	E.E.,'30	Allentown
Diener, Earl William	Ch.E.,'28	Allentown
Dietrich, Harry Alfred Rockafield, Jr.	Arts, Spl.	Bethlehem
Dillon, Jeremiah Vincent	Bus.,'31	New London, Conn.
Dimont, Julius	Arts,'30	Bayonne, N.J.
Dixon, George Scott	Bus.,'31	Butler
Dixon, William Rodney	Eng.,'31	Westfield, N.J.
Doehne, Robert	E.E.,'28	Harrisburg
Donnelly, Francis James	Bus.,'30	Bridgeport, Conn.
Dorsett, George Chesley	M.E.,'29	Garwood, N.J.
Dorsey, William Herman	I.E.,'29	New Britain, Conn.
Dorworth, Charles Edwin	Eng.,'31	Bellefonte
Doss, Virgil Augustus	Arts,'30	Hawthorne, N.J.
Dotter, Harold Kleist	I.E.,'28	Carlisle
Dow, Alan Wayne	M.E.,'30	Brookline
Dow, James Neal	Arts,'30	Philadelphia
Drake, Herbert Ernest	Eng.,'31	East Orange, N.J.
Drukker, Raymond Henry	Eng.,'31	Passaic, N.J.
Dudley, Richard Moberly	Bus.,'30	Buffalo, N.Y.
Dunlap, Andrew Miller Ewing	Bus.,'31	Sharon Hill
Dunn, Harvey Hopkins, Jr.	Bus.,'30	Philadelphia
Earhart, Kenneth Allen	Ch.E.,'30	Avonmore
Early, Paul William	C.E.,'29	Reading
Easton, Elmer Charles	Eng.,'31	Newark, N.J.
Ebert, Michael Smyser	Ch.E.,'29	Wilmington, Del.
Eckhouse, Robert Horace	E.E.,'28	Brooklyn, N.Y.
Eckrote, Kenneth Richard	E.M.,'29	Conyngham

Eddleston, James Henry	Eng.,'31	Easton
Edelstein, Irwin Kenneth	Eng.,'31	Albertown
Ehrlich, Lester	Arts,'31	Brooklyn, N.Y.
Eisenstaedt, Alfred	Bus.,'31	New York, N.Y.
Ekholm, Lors Eskil	Met.,'29	Rock Island, Ill.
Eldred, Kenneth Eugene	Bus.,'31	Bainbridge, N.Y.
Elliot, Joseph Harold	Bus.,'30	Marcus Hook
Elliott, Roland Arthur, Jr.	Eng.,'31	Bethlehem
Ellis, Ralph	Bus.,'28	Ridgewood, N.J.
Ellis, Robert John	I.E.,'29	Newark, N.J.
Elly, Robert Duncan	Eng.,'31	Elizabeth, N.J.
Emery, Natt Morrill, Jr., B.S. (*Haverford College*)	Bus.,'28	Bethlehem
Emery, Walter Earl	E.E.,'29	Mount Bethel
Emhardt, Frederick William	M.E.,'30	Philadelphia
Engart, Henry Stewart	Arts,'29	Doylestown
Engel, James Mack	Bus.,'30	New York, N.Y.
Engel, John Augustine	Arts,'31	Stamford, Conn.
Engelman, Robert Barnard	Bus.,'31	Yonkers, N.Y.
Engle, William Oliver	Eng.,'31	Scottdale
Enscoe, George Stuart	C.E.,'29	Port Washington, N.Y.
Enscoe, Robert Haydock	Eng.,'31	Port Washington, N.Y.
Enslin, Edgar Harley	Eng.,'31	Wilkes-Barre
Entwistle, John Lawrence	Eng.,'31	Tuckerton, N.J.
Epstein, David William	E.M.,'30	Bethlehem
Epstein, Edward	Bus.,'30	Easton
Ernst, George Gilbert	C.E.,'30	Wilkes-Barre
Erwin, Henry Kindt	Arts,'29	Bethlehem
Eschenlauer, Harold Charles	Bus.,'29	Woodcliff, N.J.
Essick, Richard Jenkinson	Eng.,'31	Reading
Ettlinger, Daniel Solinger	Arts,'31	New York, N.Y.
Evans, Albert Cameron	Arts,'28	Lancaster
Evans, Anderson Force	Arts,'30	Elizabeth, N.J.
Evans, John Powell	C.E.,'29	Freeland
Everett, John Preston	Eng.,'31	Allentown
Evers, Francis Eben	Arts,'31	East Aurora, N.Y.
Eyer, Robert Milton	Arts,'31	Allentown
Falcone, Anthony	E.E.,'30	Roseto
Farnsworth, Daniel William	Arts,'29	Montclair Heights, N.J.

Farr, Jacob Donald	Arts,'29	Allentown
Farrell, James Henry, Jr.	E.M.,'28	Mount Carmel
Faust, Henry Joseph	Arts,'31	Catasauqua
Faust, Ward Clinton	Bus.,'30	Kingston
Fauth, Harry Roosevelt	C.E.,'29	York
Favinger, Stanley Louis	M.E.,'28	Philadelphia
Fay, Everett Armstrong	Bus.,'31	Cranford, N.J.
Feakins, George Hayes	Bus.,'30	Swarthmore
Fearnside, George Washington, Jr.	C.E.,'28	Bowling Green, O.
Fehlinger, John Nicholas	Eng.,'31	Mountain Lakes, N.J.
Feissner, Herman Herbert, Jr.	Arts,'28	Eckley
Fenner, John David	Bus.,'30	South Orange, N.J.
Fenstermacher, Guy Marvin	Arts,'28	Telford
Fernandez, Ermelindo Tinoco	M.E.,'30	New York, N.Y.
Feucht, Robert	E.E.,'29	Lambertville, N.J.
Figoni, William Gordy	Arts,'31	Springfield, Mass.
Fimian, Louis Robert	Bus.,'29	Hastings-on-Hudson, N.Y.
Findon, Brent Ernest	C.E.,'30	Bethlehem
Fine, Albert Hollister	C.E.,'29	Nanticoke
Fine, Isadore	E.E.,'29	Baltimore, Md.
Fink, Milton	Eng.,'31	Hamburg
Finn, Irving Leonard	Arts,'29	Asbury Park, N.J.
First, John Yousling	Bus.,'28	Bethlehem
Fiscus, David Homer	C.E.,'29	National City, Cal.
Fish, Eugene Charles	Bus.,'31	Bethlehem
Fisher, Frederick Mertz	I.E.,'28	Wyomissing
Fisher, Thomas Frank	Phys.,'29	Williamsport
Flaster, Joel Manuel	Arts,'31	Brooklyn, N.Y.
Fletcher, Theodore Francis	C.E.,'29	Philadelphia
Flory, John Wilbur	I.E.,'29	Columbus, O.
Fluharty, David Garrison	Bus.,'29	Rockville Centre, N.Y.
Flynn, Russell Edward	Arts,'28	Concord, Mass.
Flynn, William Francis	Arts,'30	Dedham, Mass.
Foley, William Romig	E.E.,'29	Allentown
Folwell, Charles Edmund, Jr.	Eng.,'31	Allentown
Folwell, John Davies	Eng.,'31	Allentown
Fopeano, Joseph Ellsworth, B.S. (*Susquehanna University*)	E.M.,'29	Middleburg

Forstall, Walton, Jr.	Eng.,'31	Rosemont
Fort, Franklin Ryan	Bus.,'29	East Orange, N.J.
Foshay, Harry Nelson	Bus.,'29	Peekskill, N.Y.
Foster, Linton Haight	Arts,'30	Ridgewood, N.J.
Fox, Charles Dyer, Jr.	Bus.,'29	Westfield, N.J.
Fox, Denton Edward	Ch.E.,'29	Reading
Frantz, Alvin Jacob	Ch.E.,'30	Allentown
Frantz, George Leonard Cole, Jr.	Eng.,'31	Kingston
Frederick, Charles Otto, Jr.	Bus.,'31	Port Chester, N.Y.
Frederick, John George	Bus.,'31	Upper Darby
Freehafer, John Edwin	Eng.,'31	Reading
Freese, Frank Bernard	Eng.,'31	Lyndhurst, N.J.
French, Henry Nelson	E.E.,'28	Stamford, Conn.
Frey, John Carl	E.E.,'28	Wilkes-Barre
Friedman, Bertram Jacob	Bus.,'31	New York, N.Y.
Friedman, Michael	Arts,'31	Newburgh, N.Y.
Friedrich, Ferdinand LaRue	Eng.,'31	Hawthorne, N.J.
Fritts, James Anthony	Arts,'31	Phillipsburg, N.J.
Frutkin, Leonard Baxter	Arts,'30	New Rochelle, N.Y.
Fry, William Rawlings	C.E.,'30	New York, N.Y.
Fullagar, John Wotring	C.E.,'30	Catasauqua
Fuller, Samuel Cassedy	Eng.,'31	Pittsburgh
Fulmer, John Edward	Bus.,'30	Bethlehem
Furber, Joseph Francis	Eng.,'31	Harrisburg
Furman, William Amies, Jr.	Eng.,'31	Trenton, N.J.
Gabler, Ernest Lang	Met.,'30	Holyoke, Mass.
Gadd, Franklin Willis	Eng.,'31	Hartford, Conn.
Gadd, Robert Foster, Jr.	Eng.,'31	Hartford, Conn.
Gade, Roy Andrew	Arts,'29	Metuchen, N.J.
Galanos, Miltiades Nicholas	Eng.,'31	New York, N.Y.
Galvin, Walter Corlett	Eng.,'31	Jamaica, N.Y.
Gans, Henry Bateman, Jr.	Ch.E.,'29	Uniontown
Ganser, Paul	Eng.,'31	Norristown
Gardner, Evan Harris	C.E.,'28	Bethlehem
Garrison, John Hazlett	M.E.,'28	Pittsburgh
Garwood, Samuel, Jr.	Bus.,'29	Medford, N.J.
Gatch, Andrew Phillippe	Bus.,'31	Baltimore, Md.
Geary, Daniel Henry	Bus.,'31	Springfield, Mass.

Gee, Alden White	Bus.,'29	Fall River, Mass.
Gehrke, John William	E.E.,'29	Reading
Geib, William High	Chem.,'30	Reading
Geisenderfer, Paul Frederick	C.E.,'28	Bethlehem
Genner, William Gordon, Jr.	Arts,'31	Great Neck, N.Y.
Gennet, Irving	Arts,'31	Newark, N.J.
George, Ruel Billings	E.E.,'29	Tunkhannock
Gerwig, Edward Charles, Jr.	I.E.,'29	Parkersburg, W.Va.
Gery, Thomas Kramer	Arts,'29	Allentown
Gettys, Paul Eugene	C.E.,'30	Harrisburg
Gibson, Robert Jennings	Arts,'28	Chaptico, Md.
Gidding, Samuel Solomon	Arts,'30	Wildwood, N.J.
Gilbert, DeWitt Cromwell	E.E.,'29	Hackensack, N.J.
Gillham, Robert Paul	I.E.,'28	St. Petersburg, Fla.
Gilmore, Paul George	Arts,'28	California
Gilson, Robert Rolfe	Arts,'31	Salisbury, Md.
Giordano, Emilio	Arts,'28	New York, N.Y.
Girdler, Joseph Hayes	E.M.,'30	Pittsburgh
Glace, Kenneth William	Eng.,'31	Bethlehem
Goehring, William Henry, Jr.	Eng.,'31	New Brighton
Goepp, Ralph Max, Jr.	Chem.,'28	Philadelphia
Goldberg, Joseph Lincoln	Arts,'30	Brooklyn, N.Y.
Goodale, Walter Deming, Jr.	E.E.,'28	East Orange, N.J.
Goodlove, William Francis	Bus.,'31	New York, N.Y.
Goodman, David Leonard	Arts,'30	Brooklyn, N.Y.
Goodman, Milton	Bus.,'28	Bethlehem
Goodman, Samuel Harry	Bus.,'31	Bethlehem
Goodwin, Kenneth Wade	I.E.,'30	Millville, N.J.
Gordon, Saul	Arts,'28	New York, N.Y.
Gorman, Edward Thomas	Bus.,'29	Allentown
Gott, Edwin Hays	I.E.,'29	Pittsburgh
Goudy, William Leonard	Arts,'30	Glen Ridge, N.J.
Gould, William	E.M.,'28	Brooklyn, N.Y.
Grady, Lester Dewar, Jr.	Ch.E.,'28	Caldwell, N.J.
Graham, Edward Jerome, Jr.	Bus.,'31	Norwich, Conn.
Granacher, Charles Willard	C.E.,'29	Scranton
Gray, John Patrick	Bus.,'31	Bethlehem
Green, Albert Eberhart	I.E.,'29	Collingswood, N.J.
Green, Benjamin	Bus.,'29	Brooklyn, N.Y.
Green, Edward James	Eng.,'31	Bethlehem

Green, William Jennings	M.E.,'30	Stemmers Run, Md.
Greene, John Philip	Arts,'31	Keeseville, N.Y.
Greene, Orville Nathaniel	Arts,'29	Bethlehem
Greenstein, Charles Edward	Arts,'31	Suffern, N.Y.
Gregg, Stephen Lincoln	Eng.,'31	Washington, D.C.
Griffith, Arthur Franklin	E.E.,'30	Catasauqua
Griffith, Charles Beall	M.E.,'28	Washington, D.C.
Griffith, David Pendril	E.E.,'30	Catasauqua
Grimes, Howard Becker	C.E.,'30	Womelsdorf
Grosh, John Baker	C.E.,'30	Lititz
Grubbe, David James	Bus.,'30	West New Brighton, N.Y.
Grunwell, Gilbert Butterfield	C.E.,'28	Punta Gorda, Fla.
Gunthorp, Thomas Lloyd	M.E.,'30	Philadelphia
Guyatt, Cecil William	E.E.,'29	Bogota, N.J.
Gwynne, Henry Collins	Bus.,'30	New York, N.Y.
Haag, Vaughan	Arts,'30	Philadelphia
Haas, Charles Francis	E.E.,'28	Mazatlan, Sinaloa, Mexico
Haas, Manfred Jacques	Eng.,'31	New York, N.Y.
Hagedorn, Ernest Walter	Arts,'31	Spring Valley, N.Y.
Haitsch, Emil John	Bus.,'30	Irvington, N.J.
Haldeman, John Henry	Arts,'31	Upper Darby
Hall, Robert Everett, Jr.	Bus.,'31	Plainfield, N.J.
Hall, Samuel Lindsay	Eng.,'31	Hackensack, N.J.
Hallock, Hadley Alden	Bus.,'30	Palmerton
Hamburger, Bernard Robert	Arts,'30	New York, N.Y.
Hamburger, Louis Benjamin	Arts.,'31	Mount Vernon, N.Y.
Hamilton, Andrew William, III	Bus.,'30	Philadelphia
Hamp, John Wilson	Eng.,'31	**Staunton, Va.**
Hand, Walter Merwyn, Jr.	I.E.,'29	Culver, Ind.
Hanf, Harry Francis	Arts,'29	Jersey City, N.J.
Hang, Albert Adolph	E.E.,'29	Bronx, N.Y.
Hansen, Henry Cornelius	Arts,'28	Brooklyn, N.Y.
Hansen, William Knox Wilson	Ch.E.,'29	Penn
Harding, Clyde Albert	Arts,'31	Pen Argyl
Hargan, Frederick Dobson	Eng.,'31	Bayonne, N.J.
Harley, Dudley Lee	Arts,'31	Martinsburg, W.Va.
Harris, Alfred Victor, Jr.	I.E.,'28	New York, N.Y.

Harris, Robert Harris	Eng.,'31	Narberth
Harrison, John Sidney	Eng.,'31	Oakmont
Harrower, Wilbur Parkhurst	Eng.,'31	Plainfield, N.J.
Hartman, Brooks Rapp	Arts,'30	Allentown
Hartman, James Busse	Eng.,'31	Allentown
Hartman, Roland Franklin	Bus.,'28	Allentown
Hartung, George Hazlette	E.E.,'29	Phillipsburg, N.J.
Hartzell, George Wellington	Arts,'30	Bethlehem
Harwood, Thomas James, Jr.	C.E.,'29	East Islip, N.Y.
Hawkins, Thane Edwin	M.E.,'30	Harrisburg
Hays, John Henderson	Eng.,'31	Montclair, N.J.
Healy, Evans Maitland	E.E.,'29	Minneapolis, Minn.
Hebbard, George Miller	Ch.E.,'29	Washington, D.C.
Heffner, Joseph Hemig	Bus.,'31	Intervilla
Heil, Clinton Franklin	Arts,'28	Bethlehem
Heil, Wilbur Samuel	Arts,'29	Allentown
Heilman, James Martin	E.E.,'30	Harrisburg
Heilman, William Milton	Arts,'28	Kittanning
Heilman, William Owen	Ch.E.,'29	Harrisburg
Heim, Carl Frederick, Jr.	Arts,'31	Philadelphia
Heim, Kenneth Ethelbert	Arts,'28	Reading
Heimerdinger, Morris, Jr.	Arts,'30	New York, N.Y.
Helmstaedter, John William	Bus.,'28	Newark, N.J.
Hemphill, Charles Williams	Eng.,'31	Philadelphia
Henry, Andrew Max	E.M.,'29	Augusta, Ga.
Herbruck, Robert Ashton	E.E.,'30	Dayton, O.
Herman, Frank John	E.E.,'29	Northampton
Herman, Lester Carl	E.E.,'30	Easton
Herman, William Emanuel	Eng.,'31	York
Hertzler, Robert Rowe	Bus.,'30	Lancaster
Herwitz, Clarence Joel	Bus.,'28	Brooklyn, N.Y.
Hess, Aaron Elwood	Bus.,'30	Lancaster
Hess, Robert Graves	Eng.,'31	Dallas
Hesse, Harry Louis	Arts,'29	Roselle Park, N.J.
Hewitt, James Richard, Jr.	E.M.,'30	Baltimore, Md.
Hewitt, Leslie Randall	C.E.,'30	Ocean View, N.J.
Heyman, Milton Lawrence	Bus.,'30	Danbury, Conn.
Heyser, Carl John, Jr.	Bus.,'29	Brooklyn, N.Y.
Hickman, Paul	C.E.,'30	Arlington, N.J.
Hill, Frank Patterson, Jr.	Bus.,'30	Philadelphia

Hill, Nathaniel Caldwell	C.E.,'28	Oak Park, Ill.
Hindson, Theodore Philip	Eng.,'31	Freeland
Hinman, Kenneth Russell	Eng.,'31	Plainfield, N.J.
Hires, Benjamin Franklyn	Arts,'31	Roadstown, N.J.
Hirschhorn, Murray Lewis	Arts,'31	Brooklyn, N.Y.
Hite, Francis Ely	Eng.,'31	Huntington, W.Va.
Hoag, Robert Chester	Arts,'30	Newark, N.J.
Hoaster, Donald Jonas	Bus.,'29	Lebanon
Hoaster, Russell Eugene	Bus.,'31	Lebanon
Hobbs, Herbert Clarence, Jr.	C.E.,'29	Brooklyn, N.Y.
Hobson, Joseph Mansfield	Bus.,'31	Philadelphia
Hoehn, Walter George	E.E.,'30	Bogota, N.J.
Hoeke, William Warren, Jr.	E.E.,'28	Washington, D.C.
Hoffman, John Albert	C.E.,'28	**Fleetwood**
Hoffman, Kermit Bernecker	E.E.,'28	Allentown
Holstein, Earl	Arts,'30	Pottsville
Holt, Henry Whiting	Arts,'29	Pittsburgh
Holtz, Jehiel	E.M.,'28	Brooklyn, N.Y.
Holtzman, Stephen Robert	Eng.,'31	Hastings-on-Hudson, N.Y.
Holzshu, John Henry	Eng.,'31	Cumberland, Md.
Homsher, Joseph Bert	E.E.,'30	Strasburg
Honig, Emanuel Aaron	Arts,'31	Newark, N.J.
Hoover, John Alexander	Bus.,'31	Mechanicville, N.Y.
Hopkins, William George, Jr.	Bus.,'31	Woodbury, N.J.
Hopkins, Zebulon Corbin	C.E.,'28	Dover, Del.
Horgan, Andrew Bothwell	E.E.,'29	Orange, N.J.
Horner, Daniel Meade	M.E.,'28	Oberlin
Horowitz, Mortimer	Arts,'29	Brooklyn, N.Y.
Horton, Leonard Mead	Bus.,'28	Glen Ridge, N.J.
Horvath, Paul Joseph	Arts,'29	Bethlehem
Hottinger, Edwin Jack	Met.,'30	Kenvil, N.J.
Hoyer, William Ellison	Arts,'31	Glen Ridge, N.J.
Hufnagel, Bernhard Minot	Arts,'29	Mount Vernon, N.Y.
Hufnoval, Joseph Andreas	Bus.,'31	Irvington, N.J.
Hunt, George Edward	C.E.,'30	East Orange, N.J.
Huntington, Levin Baker, Jr.	Eng.,'31	Annapolis, Md.
Hutchins, William Joseph	Bus.,'31	East Orange, N.J.
Ihle, Max Ernst	Eng.,'31	Bethlehem
Illick, Joseph Edward	C.E.,'29	Bethlehem

ImHof, Rudolf Emanuel	Eng.,'31	Reading
Imwold, John Charles	C.E.,'28	Baltimore, Md.
Inaba, Minoru	C.E.,'29	Kobe, Japan
Ingersoll, James William	Eng.,'31	Buffalo, N.Y.
Inglis, John Scott	Arts,'29	Scranton
Irvin, Russell Spencer Elliott	Ch.E.,'30	Reading
Isaacson, Carl	C.E.,'29	New York, N.Y.
Jackson, Charles Stoboy	M.E.,'30	Williamsport
Jacobi, John Edward	Arts,'29	Bayonne, N.J.
James, William Scott	Arts,'31	Newark, N.J.
Jaslow, Seymour Paul	Arts,'31	New York, N.Y.
Jatlow, Daniel Albert	Bus.,'29	Elizabeth, N.J.
Jeanson, Charles August, III	Eng.,'31	Brooklyn, N.Y.
Jeffries, Joseph, Jr.	E.E.,'30	Hollis, N.Y.
Jenkins, Carl Henry	E.E.,'29	Camden, N.J.
Jenkins, Harry Stothoff	Eng.,'31	Bethlehem
Jester, Frederick Belden	Arts,'29	Dallas, Tex.
Jester, George Comegys	M.E.,'30	Delaware City, Del.
Jewell, Robert Burnett	C.E.,'28	Winsted, Conn.
Job, Frederick Dwight	Eng.,'31	Scranton
Job, Robert Bertram	C.E.,'30	Nanticoke
Johnson, Albert Cronquist	Bus.,'30	Bridgeport, Conn.
Johnson, Austin Harry	Bus.,'31	Highlands, N.J.
Johnson, Clifton Whatford	E.M.,'28	New York, N.Y.
Johnson, Daniel Pierson	Eng.,'31	Swarthmore
Johnson, John Edwin	E.E.,'30	Collegeville
Johnston, Richard Boles	Bus.,'31	Orlando, Fla.
Jones, Edward Jackson	C.E.,'30	Harford
Jones, Frank Addison	Eng.,'31	Washington, D.C.
Jones, Lyle Laughlin, Jr.	I.E.,'30	Greensburg
Jones, Maurice William	Bus.,'31	Bethlehem
Jones, Robert Duggan	Eng.,'31	Kingston
Jones, Robert Vaughan	Bus.,'30	Brooklyn, N.Y.
Jones, Roland John	Arts,'28	Bath
Jones, Thomas Irving	Bus.,'30	Birmingham, Mich.
Jordan, Lester Earl	C.E.,'29	Allentown
Judd, Pearson Morris	Arts,'31	Scranton
Justice, Preston Gould	Arts, Spl.	Bethlehem
Kadel, George Boyer	Eng.,'31	Baltimore, Md.
Kahn, Edward	Arts,'30	Allentown

Kambhu, Chuan Chuen	Eng.,'31	Bangkok, Siam
Kanter, Lawrence	Arts,'30	New York, N.Y.
Kantner, Ogden Austin	Eng.,'31	Cresskill, N.J.
Kaplan, Morris Elliot	Arts,'31	Hartford, Conn.
Kappes, Harold George	Arts,'31	Cincinnati, O.
Karr, Raymond Arthur	C.E.,'30	Haddon Heights, N.J.
Kaufman, Jacob Lincoln	Eng.,'31	Elizabeth, N.J.
K'Burg, Richard Bauman	Ch.E.,'28	Forty Fort
Kehler, Henry Neff	Eng.,'31	Columbia
Keith, Edward Stanley	Arts,'30	Sandy Run
Keller, Harry Summy, Jr.	M.E.,'30	Bloomsburg
Kellett, William Platt, Jr.	Eng.,'31	Brantford, Ontario, Canada
Kelley, John Charles	Bus.,'28	Harrisburg
Kelly, Eugene Thomas	C.E.,'28	Brooklyn, N.Y.
Kelly, Harry Charles	Eng.,'31	Wilkes-Barre
Kelly, John Dale	Phys.,'29	Pelham Manor, N.Y.
Kelly, William Dunham, II	C.E.,'30	Philadelphia
Kelly, William Patrick	Bus.,'31	Bethlehem
Kelsey, John Hamilton	Bus.,'31	Independence, Kan.
Kendig, John Brubaker	Bus., Spl.	Lancaster
Kennedy, Richard Morris	E.E.,'28	Lansford
Kepner, Donald Clark	Eng.,'31	Steelton
Keyser, Cares Creighton	C.E.,'28	Camden, N.J.
Kidder, Calvin Parsons	Met.,'29	Forty Fort
Kieffner, Richard Greshoff	Bus.,'30	Washington, D.C.
Kiep, Julian Anthony	E.E.,'29	Joliet, Ill.
Kilpatrick, Harry Colman	Bus.,'30	East Orange, N.J.
Kime, Ansley Lewis	Eng.,'31	Belleville, N.J.
King, Charles Preston John	E.E.,'30	West Catasauqua
King, Gilbert Westmore	Arts,'31	Glen Ridge, N.J.
King, Harold Collins	Bus.,'31	Waterville, N.Y.
Kinkaid, John Wells	Arts.,'30	Sistersville, W.Va.
Kirkpatrick, John Irvine	Bus.,'29	Woodhaven, N.Y.
Kise, Leroy Herman	Bus.,'28	Allentown
Kise, Mearl Alton	Ch.E.,'30	Allentown
Kiser, Robert William, Jr.	Bus.,'31	Pittsburgh
Kissner, Franklin Haase	Arts,'30	Bethlehem
Klein, August Richard	Eng.,'31	New York, N.Y.
Klein, Leonard	Arts,'31	Brooklyn, N.Y.

Klein, Wilson Goodwin	C.E.,'29	Irvington, N.J.
Klempner, Paul	Arts,'28	Trenton, N.J.
Kline, Robert Patterson	C.E.,'30	Fairmont, W.Va.
Knecht, John Elmer	C.E.,'30	West Collingswood, N.J.
Knight, John Gibbons	I.E.,'28	Easton
Koch, Edward Monroe	Arts,'31	Reading
Koch, Paul Henry	M.E.,'28	Macungie
Koehler, Carl Jacob	Ch.E.,'28	Pleasantville, N.J.
Kolodin, Carl	Arts,'31	South Orange, N.J.
Koondel, Irving	Arts,'31	Brooklyn, N.Y.
Korody, Nicholas Dennis	Eng.,'31	Bethlehem
Korszniok, John	E.E.,'28	Saugatuck, Conn.
Kosminsky, Jack Laurie	Bus.,'28	Reading
Kost, Edward Paul	Met.,'28	Torrington, Conn.
Kost, Kenneth Karl	Arts,'31	Gary, Ind.
Kostes, John Richard	E.E.,'29	Shenandoah
Kramer, Henry	Bus.,'29	Brooklyn, N.Y.
Kramer, Milton	Arts,'31	Allentown
Kramer, Norman John	E.E.,'28	Rutherford Heights
Kratz, Philip	Ch.E.,'29	Bethlehem
Krause, Charles Kenneth	E.E.,'28	Harrisburg
Kreidler, Carl Lester	C.E.,'30	Bethlehem
Kress, Edward Montieth	M.E.,'30	Staten Island, N.Y.
Kricker, William Mathias	Eng.,'31	Sparrows Point, Md.
Krone, Robert	Eng.,'31	Hackensack, N.J.
Krott, Carl Harry Herbert	Eng.,'31	Reading
Kuchinski, Frank Edwin	E.M.,'28	Minooka
Kuntz, Allen Franklin	Eng.,'31	Walnutport
Kuntz, Stephen Albert	E.E.,'30	Allentown
Kurtz, Carl Frederick	I.E.,'29	Bethlehem
Laedlein, William Augustus	M.E.,'28	Williamsport
Laird, Reed Gehret	Met.,'30	Reading
Lamb, Elias Morton, Jr.	Eng.,'31	Natalie
Lambert, Richard Charles	E.E.,'29	Bethlehem
Lambert, Robert Adolf	Arts,'30	Bethlehem
Landis, Arthur Clair, Jr.	Arts,'30	Hamburg, Germany
Lane, Franklin Leroy	Met.,'30	Baltimore, Md.
Lange, George Desmond	Arts,'30	Cape May Court House, N.J.

Laughaar, Henry Lewis	Eng.,'31	Hackettstown, N.J.
Laramy, Robert Edward, Jr.	Arts,'30	Altoona
Larsen, Andrew Gotfred	Bus.,'29	Port Washington, N.Y.
Lasher, Wendell Lucas	Bus.,'28	Morris Plains, N.J.
Latham, John Ralph	Bus.,'31	Greenwich, Conn.
Latimer, Floyd	I.E.,'30	High Bridge, N.J.
Latremore, Robert Francis	I.E.,'30	West Orange, N.J.
Latsha, Milton Paul	E.E.,'30	Shamokin
Lattig, Charles Richard	Eng.,'31	Bethlehem
Laudenslager, Richard Loose	E.E.,'28	Schwenksville
Lawrence, Edward Morris	Bus.,'29	Salem, N.J.
Lawrence, Walter Welling	Eng.,'31	Brooklyn, N.Y.
Laws, Llewellyn, Jr.	Arts,'31	Philadelphia
Lawshe, Theodore Thatcher, Jr.	Bus.,'31	Newark, N.J.
Leader, Charles Carlton, Jr.	E.E.,'28	Shamokin
Leader, John Richard	E.E.,'29	Shamokin
Lee, Edward Alexander	Bus.,'31	San Juan, Porto Rico
Lee, John Roscoe	Bus.,'31	Kingston
Lehr, Arthur	Arts,'29	Ridgewood, N.Y.
Lehr, Clarence	Arts,'31	Ridgewood, N.Y.
Lehrer, Herman	Arts,'29	New York, N.Y.
Leister, Claude Merrill	Arts,'28	Bethlehem
Leitner, Frederick	Arts,'31	Bethlehem
Lembeck, Paul Joseph	Bus.,'30	Jersey City, N.J.
Lenna, Harry Albert	Bus.,'28	Jamestown, N.Y.
Lentz, Robert Pierce, Jr.	I.E.,'30	Eggertsville, N.Y.
Leonard, Joseph Claver	Eng.,'31	South Fork
Leraris, Dominic	Eng.,'31	Bangor
Lerch, Russel Otterbein	E.E.,'29	Palmyra
Lessig, Linwood Glen	Arts,'30	Pottstown
Letowt, Zigmont Joseph, Jr.	Arts,'30	Hazleton
Levin, Leon	Arts,'28	Trenton, N.J.
Levine, Samuel Ellas	Arts,'29	North Adams, Mass.
Levitz, Benjamin	Bus.,'28	New York, N.Y.
Levitz, Jacob	Arts,'30	New York, N.Y.
Levy, Aaron Reuben	Arts,'31	Brooklyn, N.Y.
Levy, Robert Joseph	E.E.,'28	New York, N.Y.
Lewis, Alvin Bower	Arts,'29	Bethlehem
Lewis, Leon	C.E.,'30	Reading

Lewis, Philip Cornelius	Eng.,'31	Brooklyn, N.Y.
Lewis, Raymond Harper	Bus.,'30	Buffalo, N.Y.
Lewis, Robert Beckwith	I.E.,'28	Bethlehem
Lewis, Samuel	C.E.,'28	Allentown
Lewis, Thomas Baird	Bus.,'30	Kingston
Lewis, Thomas Richard, Jr.	Bus.,'31	Jersey City, N.J.
Liberman, Melville Norman	Bus.,'29	White Plains, N.Y.
Licciardi, Louis Joseph	Arts,'30	Brooklyn, N.Y.
Lincoln, Robert James	E.E.,'30	East Orange, N.Y.
Linn, William Park	Bus.,'29	Glen Ridge, N.J.
Linn, Willis Frederick	Eng.,'31	Tremont
Lipshitz, Leo	Arts,'31	Rockaway Park, N.Y.
Listman, John Reinhold	Bus.,'30	Philadelphia
Little, James Stuart	Bus.,'31	Pelham, N.Y.
Lockhart, Hayden James	Bus.,'31	Parkersburg, W.Va.
Loeser, Chester Milton	I.E.,'30	Elizabeth, N.J.
Lohmeyer, William Carl	Bus.,'31	Baltimore, Md.
Longacre, Jacob James	Arts,'28	Northampton
Loomis, Francis Earl	E.E.,'30	Jamaica, N.Y.
Lord, Carleton	Eng.,'31	Glenside
Lord, John Arthur	Eng.,'31	Philadelphia
Lowenstein, Charles Raymond	Arts,'31	Newark, N.J.
Lowenthal, Howard Irving	Arts,'31	Philadelphia
Lowry, William Watt	Eng.,'31	Chicago, Ill.
Lubow, Louis Alan	Ch.E.,'30	Vineland, N.J.
Lummis, Warren Cleaveland, Jr.	Bus.,'31	Bridgeton, N.J.
Lutz, John Adam, Jr.	Ch.E.,'28	Myerstown
Lyman, Richard Patrick	Bus.,'31	Hazleton
Lynn, George Randal, Jr.	C.E.,'28	Pottsville
Lynn, Harold William	Chem.,'29	Bethlehem
Lyons, Edward, Jr.	Arts,'30	Brooklyn, N.Y.
Lyons, John Martin, Jr.	Bus.,'31	Princeton, N.J.
Lyter, John Alfred	Ch.E.,'29	Harrisburg
MacCalla, Willard Arrison	I.E.,'30	Youngstown, O.
MacCartney, Clarence Wallace	Arts,'31	Pottsville
MacDonald, James Thomas, Jr.	Bus.,'31	New York, N.Y.
MacDougall, Willis Clayton	Eng.,'31	East Orange, N.J.
MacGillis, Donald John, Jr.	C.E.,'30	Jacksonville, Fla.
MacQueen, Hugh Kenneth	Bus.,'30	Horseheads, N.Y.

McAlarney, James Lougenberger	Eng.,'31	Plymouth
McAlarney, John Charles, Jr.	Phys.,'30	Plymouth
McBride, Charles Rhoades	Eng.,'31	Oakmont
McCarthy, Francis William	C.E.,'29	St. Clair
McCarthy, Harris	Bus.,'30	Buffalo, N.Y.
McClain, John Francis	Eng.,'31	Lancaster
McClarin, Robert Taylor	Ch.E.,'28	Philadelphia
McClaskey, George Arthur	C.E.,'30	Canton, O.
McConnell, Edward Clark	Arts,'31	Williamsport
McCoy, George Ingersoll	Bus.,'29	Peekskill, N.Y.
McDonough, Leigh Irving	Met.,'30	Brooklyn, N.Y.
McElroy, Alexander Thomas	Eng.,'31	Corona, N.Y.
McGarrity, William Fisher	Ch.E.,'30	Youngstown, O.
McGovern, Edward William	Ch.E.,'28	Bethlehem
McHugh, Joseph William, Jr.	Arts,'30	Philadelphia
McKinney, Donald Louis	Bus.,'31	Titusville
McLachlan, John, Jr.	Bus.,'30	East Elmhurst, N.Y.
McLaughlin, Conrad	E.E.,30	Philadelphia
McLeod, Donald Spence	Bus.,'30	Elmira, N.Y.
McLernon, Joseph Francis	Bus.,'30	Bethlehem
McNeill, Alfred Mason	Bus.,'31	Philadelphia
McNickle, Arthur John	Bus.,'30	Newark, N.J.
McWilliams, Herbert Gladstone	E.E.,'30	Duquesne
Macartney, John William, Jr.	Bus.,'31	East Orange, N.J.
Macgeorge, William Dean	C.E.,'30	Vineland, N.J.
Mackey, Kenneth King	Bus.,'31	Elizabeth, N.J.
Magill, Arthur Edward	Bus.,'29	Newark, N.J.
Maginniss, Hamilton John	I.E.,'29	Philadelphia
Maher, Joseph Hannon	Bus.,'31	Buffalo, N.Y.
Maier, Curtis Eugene	Ch.E.,'28	Allentown
Maier, Franz Joseph	Eng.,'31	Royersford
Maiese, Domenick	E.E.,'28	Camden, N.J.
Malinsky, Jack Mortimer	Bus.,'29	Brooklyn, N.Y.
Malmros, Alf	Eng.,'31	Roslyn Heights, N Y.
Mancke, Richard Bell	E.E.,'29	Bethlehem
Mango, Wilfred Gilbert	Bus.,'31	Woodcliff, N.J.
Manley, John Howard	Bus.,'30	Brooklyn, N.Y.
Manner, Richard Jacob	E.E.,'28	Bethlehem

Manning, Clayton Sweet	Eng.,'31	Newburgh, N.Y.
Manning, Streckfus William	Bus.,'31	North Canton, O.
Many, Robert Howland, Jr.	I.E.,'30	Bayonne, N.J.
Marcus, Leonard Charles	Bus.,'30	Atlantic City, N.J.
Marino, Salvatore Charles	Arts,'31	New York, N.Y.
Marlatt, Kenneth Jack	Eng.,'31	Hackettstown, N.J.
Marsh, Alva VanRensselaer	Bus.,'31	Baltimore, Md.
Marshall, John Thompson	M.E.,'30	Langhorne
Martin, Frank Ralph	Bus.,'31	Columbus, O.
Martin, Lester Charles	Arts,'31	Elizabeth, N.J.
Martindale, Wight	Bus.,'29	Glen Ridge, N.J.
Martz, Chester Grant	Bus.,'29	Harrisburg
Mastri, Dominic	Bus.,'28	Scranton
Matchett, Thomas Webster	Eng.,'31	Passaic, N.J.
Matson, Frederic Church	E.E.,'28	Washington, D.C.
Matt, George Burl	Bus.,'31	Columbus, O.
Mayberry, William McCandless	Bus.,'31	Philadelphia
Mayer, Hyman	Arts,'31	Brooklyn, N.Y.
Mayer, Samuel Arthur	Arts,'30	Brooklyn, N.Y.
Mead, Stuart Bartlett	Bus.,'29	Saratoga Springs, N.Y.
Meharg, John George	Arts,'31	Hamburg
Melhorn, Henry Boyer	Arts,'31	Philadelphia
Mendenhall, Leroy Wilson	Bus.,'29	Philadelphia
Mercur, Henry	Arts.,'28	Philadelphia
Mertz, John Clewell	Eng.,'31	Allentown
Messinger, Clyde Uhler	M.E.,'28	Tatamy
Mestre, Abel	Bus.,'31	Santiago, Cuba
Metzger, Malcolm Thomas	Eng.,'31	Bethlehem
Meyers, Edwin Truman	Eng.,'31	Red Lion
Michael, Henry Edward	C.E.,'30	Havre de Grace, Md.
Middleton, Plantou	I.E.,'29	Philadelphia
Midlam, Edward West, Jr.	Ch.E.,'29	Philadelphia
Miebach, Frederick William	Arts,'30	Paterson, N.J.
Millelot, Leon Sylvester	Eng.,'31	Lyndhurst, N.J.
Miller, Bertram Nicholas	Bus.,'30	Elizabeth, N.J.
Miller, Carl Andrew	Eng.,'31	Rosebank, N.Y.
Miller, Chester Miller	Arts,'31	Lancaster
Miller, Daniel George	I.E.,'28	Spring Glen
Miller, Dustin Yach	Ch.E.,'30	Lyndhurst, N.J.

Miller, Edwin Jacob	Arts,'29	Bethlehem
Miller, Gilbert	Arts,'28	Bethlehem
Miller, Harry	Arts,'31	Bethlehem
Miller, James Francis	Arts,'31	Tarentum
Miller, John Ephriam, Jr.	Arts,'31	Shamokin
Miller, John Stanley	Bus.,'28	Harrisburg
Miller, John Zollinger	Ch.E.,'29	Harrisburg
Miller, Luther Jacob Calvin	C.E.,'30	Allentown
Miller, Oscar Ralph	Arts,'31	Brooklyn, N.Y.
Miller, Richard Jean	Ch.E.,'30	Scottdale
Miller, Samuel Simon	Arts,'31	Danville
Miller, Walter Lee	I.E.,'28	Wernersville
Miller, William Edward, Jr.	Bus.,'30	Baltimore, Md.
Miller, William Schuyler	Chem.,'30	Allentown
Miller, Winton Lucius, Jr.	Eng.,'31	Princeton, N.J.
Milson, Charles Alfred	Arts,'31	West Catasauqua
Miner, Frederick Prentice	Arts.,'31	New London, Conn.
Minsker, John Henry	Eng.,'31	East Aurora, N.Y.
Miracolo, Charles	Arts,'31	Brooklyn, N.Y.
Miralia, David Theodore	Arts,'29	Mamaroneck, N.Y.
Miranda, Juan Eleazar	Eng., Spl.	Hda Laredo, Peru
Mitchell, Daniel Patrick, Jr.	Bus.,'28	Woodbury, N.J.
Mitchell, Louis Wells	Bus.,'31	Ventnor City, N.J.
Mittendorff, Edward Max	M.E.,'28	Barmen, Germany
Moffett, Marvin Charles	Eng.,'31	Coatesville
Monness, Abbott Ross	Arts,'31	New York, N.Y.
Monroe, Stuart Alexander	Bus.,'31	Hazleton
Monsell, John Reginald	M.E.,'30	Greenport, N.Y.
Montenecourt, Jean Antoine	Eng.,'31	Cranford, N.J.
Moomy, Richard Eugene	Bus.,'31	Carlisle
Moore, Raymond Louis	Bus.,'31	Hyannis, Mass.
Morhart, Frederick Henry	Arts,'31	Washington, D.C.
Morrison, Bruce	Bus.,'29	Stamford, Conn.
Morrison, James Carleton	Bus.,'28	Ithaca, N.Y.
Morton, Donald Douglas	C.E.,'30	Woodhaven, N.Y.
Moser, Paul Alfred	Arts,'29	Freemansburg
Moses, Harlan Taft	Bus.,'31	Providence, R.I.
Motion, Robert	Eng.,'31	Madison, N.J.
Mount, Wilbur Shepherd	Eng.,'31	Princeton, N.J.
Moyer, George Weldon	E.M.,'28	Souderton

Mueller, Wesley William Samuel	I.E.,'28	Maplewood, N.J.
Muendel, Harold John	Ch.E.,'30	Woodcliff, N.J.
Muldberg, Philip	Arts,'30	New York, N.Y.
Mullaney, Joseph Michael	Arts,'29	Concord, Mass.
Munson, Alexander Lawrence	M.E.,'30	Brooklyn, N.Y.
Muntrick, Charles Milton	Bus.,'29	Newark, N.J.
Murphy, Franklin Carpenter	Bus.,'31	Athens, O.
Murray, James Bailey	E.E.,'28	Phoenixville
Musser, William Edward	Bus.,'28	Lewistown
Myer, J. Leland	Phys.,'30	Leola
Myers, Milton Benedict	Arts,'30	Philadelphia
Myers, Richard Small	Arts,'31	York
Myers, Robert Lee, Jr.	Bus.,'29	Baltimore, Md.
Myers, Woolmer Wood	Bus.,'31	Philadelphia
Myra, Allen Esekeil	Arts.,'31	Lunenberg, Nova Scotia, Canada
Nason, Lyman Breed	E.E.,'29	Tyrone
Nauss, Morton Schultz	Bus.,'28	Wrightsville
Naylor, Fred Claus	Ch.E.,'29	Bethlehem
Neath, John Tolbert	I.E.,'29	Haddonfield, N.J.
Nemetz, Carl Joseph	Bus.,'31	East Port Chester, Conn.
Nesbitt, John James, Jr.	Bus.,'31	Ambler
Neumann, George Julius	C.E.,'29	Allentown
Neuwirth, Francis	Arts.,'31	New York, N.Y.
Nevins, Hugh	Chem.,'30	Hokendauqua
Nevins, Samuel Lyle	Arts,'28	Hokendauqua
Newhard, Henry Thomas	Eng.,'31	Fullerton
Nickowitz, Harry Samuel	Arts,'31	Newburgh, N.Y.
Nicotra, Philip	Arts,'31	Brooklyn, N.Y.
Nielson, Peer Dudahl	Met.,'29	Elyria, O.
Ninno, Pasquale	Eng.,'31	Roseto
Noedel, Ernest Henry	Eng.,'31	Reading
Nolfi, Luke Julius	Arts,'29	Glen Lyon
Norvig, Axel	Bus.,'31	Hartsdale, N.Y.
Nutter, Alfred DeWitt, Jr.	Eng.,'31	Ben Avon
Oberly, Richard Love	E.M.,'30	Scottdale
O'Connell, John Charles, Jr.	E.E.,'29	Hagerstown, Md.
Odgers, William Treverton	I.E.,'29	Parkersburg, W.Va.

Ogden, Gordon Prentiss	Bus.,'30	Great Neck, N.Y.
Olden, Joseph Bruere	C.E.,'28	Princeton, N.J.
O'Leary, Frazier Lewis, Jr.	Arts,'31	Dorchester, Mass.
O'Leary, Patrick Joseph	C.E.,'28	Waterbury, Conn.
Oliphant, John Richards, IV	Arts,'31	Orbisonia
Oller, George Ellis, Jr.	M.E.,'30	Philadelphia
Olmsted, Edward Stanley	Arts,'30	Burnside, Conn.
Ondeck, Gabriel Martin	Arts,'30	Hazleton
O'Neil, John Francis	Eng.,'31	Irvington, N.J.
O'Neill, John, Jr.	Bus.,'31	Tenafly, N.J.
O'Neill, John Francis	Eng.,'31	Wilkinsburg
Opolinsky, Bernard Lawton	Arts,'30	Brooklyn, N.Y.
Oppenheim, Miles Auranus	Bus.,'31	South Orange, N.J.
Oppenheimer, Henry, Jr.	Arts,'31	New York, N.Y.
Orr, Joseph Hughes	Eng.,'31	Altoona
Ortlip, William Marshall	Ch.E.,'28	Oxford
Osterhus, Harold Adolph	Arts,'31	Brooklyn, N.Y.
Oswald, Charles Tilghman	Ch.E.,'29	Fullerton
Ott, Frank Wesley	Bus.,'29	Allentown
Ousey, Harry Haley	Eng.,'31	Philadelphia
Ovens, William George	M.E.,'30	Endicott, N.Y.
Overfield, Budd	C.E.,'30	Bethlehem
Paganelli, Charles	Arts,'31	New York, N.Y.
Paget, Francis King	M.E.,'30	Flushing, N.Y.
Pailey, Louis	C.E.,'29	Williamstown
Paley, Leo	Arts,'29	Brooklyn, N.Y.
Palm, Harry Wendel	C.E.,'28	Bethlehem
Palm, William Flickinger	Arts,'28	Bethlehem
Palmer, Francis, Jr.	Bus.,'29	Jenkintown
Parsons, John Leonard	Eng.,'31	Troy
Paschall, Edward Merrill Bayard	Ch.E.,'28	Dauphin
Patterson, George Denison	Eng.,'31	Huntington, W.Va.
Patterson, George McKeown	E.E.,'30	Philadelphia
Payer, Harold Stephen	Arts,'29	McAdoo
Peebles, Charles Roland, Jr.	Eng.,'31	Ashland, Ky.
Pelizzoni, Eugene Attillio	M.E.,'29	Allentown
Peloubet, Philip Henry	Bus.,'28	Glen Ridge, N.J.
Pennington, Carl Shaw	C.E.,'28	Trenton, N.J.
Pennock, John Sermon	E.E.,'28	Cochranville

Perlmutter, Herbert Mervin	Bus.,'30	Newark, N.J.
Peters, James Walter, Jr.	E.E.,'29	Egypt
Pfahler, Martin Christian	Arts,'31	Windsor, Conn.
Pflueger, Richard Kenneth	Bus.,'29	Schuylkill Haven
Phares, Stanley Urmston	Arts,'29	Elizabeth, N.J.
Phelps, Edward Stanley	E.E.,'29	Rockville Center, N.Y.
Phillippi, Philip Francis	Bus.,'30	Bethlehem
Phillips, Harold	Arts,'30	Bethlehem
Pickslay, William Morton, Jr.	E.E.,'29	Mount Vernon, N.Y.
Pierson, Theodore Gordon	E.E.,'28	Washington, D.C.
Pietschker, Elmer Arthur	M.E.,'30	White Plains, N.Y.
Pietzsch, Arthur Richard	C.E.,'30	Philadelphia
Pimper, Charles William, Jr.	Ch.E.,'30	Chevy Chase, Md.
Pinkney, Oliver Brayton	Bus.,'31	Montclair, N.J.
Pitman, Walter Clarkson, Jr.	Arts,'28	Jersey City, N.J.
Platt, Lucian Henry	Bus.,'31	Saranac Lake, N.Y.
Plummer, James Harold	Bus.,'28	Williamsport
Pole, Harry Daingerfield, Jr.	E.E.,'30	Parr, S.C.
Polk, Fulbert Culbreth	M.E.,'29	Princess Anne, Md.
Pollack, Abraham	Arts,'31	Brooklyn, N.Y.
Pollack, Michael	Arts,'31	New York, N.Y.
Pollitt, William Joseph	E.M.,'29	Bridgeport, Conn.
Porch, William W.	Eng.,'31	Houston, Tex.
Post, Alfred Philip, Jr.	Eng.,'31	Philadelphia
Potter, Frank Graham	E.E.,'30	Rockville Center, N.Y.
Potter, Lawrence Sherwood	Bus.,'29	Elizabeth, N.J.
Powell, William Frederick, Jr.	Bus.,'30	Philadelphia
Powers, Richard Mair	Eng.,'31	Newton Centre, Mass.
Pragnell, James Hyde	Eng.,'31	Wilkes-Barre
Pratt, Henry Gilbert, Jr.	C.E.,'29	Washington, D.C.
Pratt, Riley	Bus.,'30	Baltimore, Md.
Pratt, Stanley Winter	Arts,'31	Nanticoke
Pratt, William Abbott, Jr.	Eng.,'31	Staunton, Va.
Price, John Schriver	Eng.,'31	Baltimore, Md.
Price, Thomas Edward	Bus.,'29	Plains
Proebstle, Carl Joseph	Bus.,'30	Atlantic City, N.J.
Probkop, George Samuel	E.E.,'29	Bethlehem
Pursel, Robert Newton	E.M.,'28	Danville

Purvis, Charles Shelton	Eng.,'31	Freeport, N.Y.
Qualey, James Dorland	Bus.,'31	Garden City, N.Y.
Quesada, Russell Lorenzo Shepherd	Bus.,'31	Havana, Cuba
Quinlan, Eugene Connett	Bus.,'29	Yonkers, N.Y.
Rabert, George Joseph	Eng.,'31	Allentown
Ragone, Frank A.	Arts,'30	New York, N.Y.
Raleigh, Walter Allen, Jr.	Bus.,'28	Baltimore, Md.
Rambler, Ralph Cassell	C.E.,'28	West Hanover
Ranck, William Edward	Bus.,'31	Llanerch
Randall, David Anton	Arts,'28	Shamokin
Rankin, Clinton Draper	Arts,'31	Bridgeport, Conn.
Rankin, James Keers	C.E.,'30	Tenafly, N.J.
Ransom, Stephen Webbe	Bus.,'30	Jersey City, N.J.
Raup, Richard Greer	Bus.,'30	Ocean City, N.J.
Raymond, George Edwin	Bus.,'31	Flushing, N.Y.
Read, Ralph Delfus	Arts,'30	Akron, O.
Reed, Louis Francis, Jr.	Arts,'31	Orange, N.J.
Reese, Robert Morris	Bus.,'30	Kingston
Reeves, Philip Henry	E.E.,'29	Wildwood, N.J.
Refowich, Harold Girard	Bus., Spl.	Bethlehem
Reid, John Graham, Jr.	M.E.,'29	Pottsville
Reill, James Bertrand	C.E.,'29	Scranton
Reimer, Elvin Emanuel	Bus.,'31	Nazareth
Reinitz, George Joseph	Bus.,'31	Brooklyn, N.Y.
Reinoehl, John Chaney	Arts,'29	Philadelphia
Remaley, Miles Edward	Bus.,'28	Brooklyn, N.Y.
Rerig, Eugene Lyons	E.E.,'28	Hazleton
Rettino, Anthony Abel	Arts,'28	Jersey City, N.J.
Reutelhuber, Oscar Millard	M.E.,'30	Kingston
Rexach, Jose Enrique	C.E.,'28	New York, N.Y.
Reynolds, Horace Taylor	Arts,'30	Malone, N.Y.
Rhodes, Floyd Maxwell, Jr.	Eng.,'31	Bethlehem
Rice, Sears Baldwin	Bus.,'30	Mahwah, N.J.
Richardson, Lincoln Thomas	Bus.,'31	Demarest, N.J.
Richart, Theodore Frederick, Jr.	Arts,'31	Elizabeth, N.J.
Riker, Herbert Adrian, Jr.	I.E.,'29	Amityville, N.Y.
Ritter, Reginald James	Ch.E.,'29	Bethlehem
Ritter, William Ray	M.E.,'30	Mechanicsburg

Rivenburgh, Malcolm Ross	Eng.,'31	Wilkes-Barre
Robbins, Ephraim Franklin	Arts,'31	New York, N.Y.
Robbins, Hammitt Lake	I.E.,'28	Port Norris, N.J.
Roberts, Arthur Llewellyn, Jr.	Met.,'29	Canton, O.
Roberts, Charles Angelo	Bus.,'29	Parkersburg, W.Va.
Roberts, Harold C.	M.E.,'30	Copenhagen, N.Y.
Roberts, Walter, Jr.	Bus.,'31	Richmond Hill, N.Y.
Roberts, William Edward	M.E.,'29	Slatington
Robinson, Malcolm Weeks	Arts,'28	Bethlehem
Robinson, Richard Rogers	M.E.,'30	Trenton, N.J.
Robrecht, Raymond Robert	Bus.,'30	Newark, N.J.
Roddy, Robert Edward Barnett	Ch.E.,'29	Harrisburg
Roderick, Rees Morgan	Chem.,'28	Wilkes-Barre
Rodkin, Arnold	Arts,'31	Brooklyn, N.Y.
Roe, Donald Wilson	Bus.,'30	Newark, N.J.
Roeder, John Seymour	Arts,'31	Richmond Hill, N.Y.
Rogers, Alfred Nathan	Ch.E.,'30	Reading
Rohrs, Henry	I.E.,'30	Ridgewood, N.J.
Romig, Harold Herbert	Ch.E.,'28	Reading
Roper, Raymond LeCount	Bus.,'29	Richmond Hill, N.Y.
Rorabaugh, Harry Crawford, Jr.	Eng.,'31	New Kensington
Rosen, Alexander	Arts,'31	New York, N.Y.
Rosen, Louis	Eng.,'31	Baltimore, Md.
Rosenbush, Arthur Mitchell	Arts.,'30	Brookline, Mass.
Rosencrans, Charles Arthur	Eng.,'31	Warwick, N.Y.
Rosenson, Arthur	Bus.,'29	Brooklyn, N.Y.
Rosenthal, John Samson	Arts,'31	New York, N.Y.
Ross, Harry Hurson, Jr.	Ch.E.,'30	Massilon, O.
Rotthaus, Walter Edmond	Bus.,'30	Allentown
Rozelle, Arlington Laverne	Eng.,'31	Carbondale
Rubino, Joseph Vincent	Arts,'28	New York, N.Y.
Rubman, Harold Louis	Arts,'30	New York, N.Y.
Ruggles, Harry Wyndam, Jr.	Arts,'31	Kingston
Rushong, Frank Anders	Eng.,'31	Collegeville
Rust, George Mooar	Eng.,'31	Birmingham, Ala.
Ryerson, Carl George Walter	I.E.,'28	Brighton Heights, N.Y.
Sachs, William Howard	Eng.,'31	Binghamton, N.Y.
Sahm, Henry Spencer	Bus.,'31	Scranton

Saler, Harold Benjamin	Arts,'31	Philadelphia
Sall, Manuel	Arts,'28	Philadelphia
Salomon, Herbert Frank	Arts,'28	New York, N.Y.
Salzenberg, Walter Henry	Ch.E.,'29	Woodcliff-on-Hudson, N.J.
Sames, Harry Bauer	Arts,'29	Bethlehem
Samuels, Bernard Edwin	Arts,'31	Brooklyn, N.Y.
Sanna, Alfred Anthony	Eng.,'31	Pen Argyl
Satenstein, Hyman	Arts,'30	New York, N.Y.
Satkowski, Charles Andrew Joseph	Arts,'31	Catasauqua
Saunders, Stanley Rathbun	Eng.,'31	Pontiac, Mich.
Savage, Rufus Llewellyn, Jr.	Eng.,'31	Asbury Park, N.J.
Sax, Robert Buchman	Bus.,'29	Philadelphia
Scandale, James Samuel	C.E.,'29	Old Forge
Scarlett, William John	M.E.,'28	Erie
Scavo, James Anthony	C.E.,'30	Old Forge
Scavo, Joseph Phillip	Ch.E.,'29	Old Forge
Schaefer, James Edward	Bus.,'29	Newark, N.J.
Schaffer, Irving	Arts,'31	New York, N.Y.
Schaffer, Paul Samuel	E.E.,'30	Fullerton
Schaub, Howard Warren	Eng.,'31	Freeland
Schaumburg, George John	Eng.,'31	Reading
Schell, John Carl	C.E.,'29	Robesonia
Schenck, Robert Faust, Jr.	Bus.,'31	Chicago, Ill.
Scherer, George Washington	Eng.,'31	Mahwah, N.J.
Schermer, Isadore	Ch.E.,'30	Bethlehem
Schick, Herman Anthony	Arts,'30	Rosebank, N.Y.
Schickedanz, August Ernest, Jr.	M.E.,'28	Hillside, N.J.
Schier, Oscar Bernhardt	M.E.,'29	Baltimore, Md.
Schiff, Adolph Weill	Arts,'29	New York, N.Y.
Schilling, Murray Courtwright	Eng.,'31	Clark's Summit
Schlein, Irving David	Bus.,'31	Brooklyn, N.Y.
Schmeltzer, Stanton Harry	Eng. Spl.	Scottdale
Schmelzer, August William	Arts,'30	Meriden, Conn.
Schmid, Frederick Christian, Jr.	I.E.,'28	New York, N.Y.
Schmidt, Joseph Albert	Eng.,'31	Wilkes-Barre

Schnabel, James Heller	Eng.,'31	Allentown
Schoen, George Lloyd	Ch.E.,'30	Atlanta, Ga.
Schoenhut, George Weber	Arts,'30	Philadelphia
Schoenhut, Norman Adolph	Eng.,'31	Philadelphia
Scholl, Cornelius Ledyard	Arts,'31	Llanerch
Schrader, Harold Wilson	C.E.,'29	Alden
Schreiner, Louis Rector	E.E.,'28	Chevy Chase, Md.
Schreiner, Norman George	C.E.,'28	Philadelphia
Schroeder, Jacob Weiskircher	Eng.,'31	McKeesport
Schultz, Manuel	Arts,'29	Jamaica, N.Y.
Schultz, Max	Arts,'30	Philadelphia
Schumaker, Frederick Lebbens	I.E.,'30	Philadelphia
Schupner, Willard Jensen	Eng.,'31	Nyack, N.J.
Schwab, Irving Hoos	Arts,'29	Bethlehem
Schwartz, Frank Leroy	M.E.,'28	Harrisburg
Schwartz, Fred	Bus.,'30	Brooklyn, N.Y.
Schwartz, Harold Milton	Arts,'30	Brooklyn, N.Y.
Schweickardt, Anton Phillip Charles	Met.,'29	Pittsburgh
Schwenk, Walter Louis, Jr.	Eng.,'31	Allentown
Schwerin, Albert Johnson	Bus.,'30	Newark, N.J.
Schwitter, Charles Martin	Met.,'29	Montclair, N.J.
Scoblionko, Emanuel George	Arts,'31	Bethlehem
Scofield, Francis Collins	Chem.,'30	Lanham, Md.
Scott, Frank Rutter, Jr.	Eng.,'31	Glenside
Scott, George Canterbury	Bus.,'31	New York, N.Y.
Scott, Norris Alexander, Jr.	Bus.,'31	Moylan Rose Valley
Seal, Paul Wesley	Eng.,'31	Factoryville
Searing, Arthur Fairchilds	Bus.,'28	Glen Ridge, N.J.
Seaton, Wesley Hughes	Bus.,'30	Oil City
Secor, Andrew Reynolds	Ch.E.,'28	Ossining, N.Y.
Seeburger, William	Eng.,'31	Philadelphia
Seiden, Leon	Bus.,'31	Lakewood, N.J.
Seligson, Julius	Bus.,'30	New York, N.Y.
Seltzer, David	Bus.,'30	Atlantic City, N.J.
Semar, Harold Walls	M.E.,'30	Philadelphia
Serber, Robert Frankel	Phys.,'30	Philadelphia
Serocca. Stanley John	E.E.,'29	Shenandoah

Serrador, Affonso	Eng.,'31	New York, N.Y.
Seward, Harold Aloysius	Arts.,'30	Parkersburg, W.Va.
Seymour, Albert Dodson	Eng.,'31	Lincoln Park, N.J.
Shafer, John Henry	Arts,'31	Allentown
Shanker, Meyer	Arts,'31	Brooklyn, N.Y.
Sharp, John Paul	Ch.E.,'29	Hackettstown, N.J.
Shaw, Benjamin Franklin	Eng.,'31	Brandywine Summit
Shay, Felix Buckley	Eng.,'31	Mount Washington, Md.
Sheen, Robert Tilton	Eng.,'31	Philadelphia
Sheetz, Kenneth Enders	Arts,'30	Enola
Shekletski, Adam Edward	Arts,'29	Wanamie
Shelden, Charles Freeman	Bus.,'30	New York, N.Y.
Shellenberger, William Howard	Eng.,'31	Bayonne, N.J.
Shenton, Dean Amandus	Eng.,'31	Slatington
Shenton, Howard Francis	Ch.E.,'28	Slatington
Sheridan, Victor Louis	Arts,'31	Bethlehem
Sherman, Joseph Russell	Arts,'28	Hazleton
Sherwood, Lloyd Clark	Arts,'30	Detroit, Mich.
Shimer, Johnston Bitler	Ch.E.,'29	Wilmington, Del.
Shindel, Conrad Frey	Eng.,'31	Scranton
Shindel, William Thomas	Bus.,'31	Scranton
Shipley, Samuel Richards	Arts,'31	Philadelphia
Shoemaker, Francis	Arts,'31	West Conshohocken
Shoemaker, George Richard	Eng.,'31	Pottstown
Shulman, Murray William	Arts,'30	Irvington, N.J.
Sickler, Richard Carl	E.M.,'29	Wilkes-Barre
Sickles, Gustavus, Jr.	I.E.,'29	Newark, N.J.
Siegrist, Roy Buckwalter	Eng.,'31	Lancaster
Sievering, Howard	E.E.,'30	Maplewood, N.J.
Silberman, Richard Edgar	Arts.,'31	Newark, N.J.
Silverman, Clarence Lewis	Bus.,'31	Mattapan, Mass.
Simes, Gardner Merritt	Bus.,'28	Brooklyn, N.Y.
Simmons, Sidney Melvin	Arts,'30	Roxbury, Mass.
Simons, Sidney Paul	Arts,'30	Bridgeport, Conn.
Simonson, Lloyd DeForest	E.E.,'29	Hazlet, N.J.
Simpson, Kenneth Moore	Phys.,'29	Pottstown
Simrell, George Wallace, Jr.	Bus.,'29	Brooklyn, N.Y.
Sinclair, Alonzo Loraine	Eng.,'31	Norristown

Sincock, Harold Edwin	Eng.,'31	Sparrows Point, Md.
Singer, Harry Frederick	E.E.,'30	Jermyn
Sinick, Sidney	Arts,'31	Brooklyn, N.Y
Skakandy, Victor	E.E.,'28	Nesquehoning
Sloshberg, Sidney	Arts,'31	Trenton, N.J.
Small, Edward Nicholas	Arts,'30	Westbury, N.Y.
Smith, Allen Edwin	M.E.,'28	Allendale, N.J.
Smith, Arthur Levern	Ch.E.,'30	Coatesville
Smith, Ephriam Koch	Eng.,'31	Swarthmore
Smith, Francis Gerecke	Eng.,'31	Newburgh, N.Y
Smith, Gene Demestere	Arts,'28	Allentown
Smith, George Edgar	Arts,'30	Plymouth
Smith, Harry Anner	Eng.,'31	Brigantine, N.J.
Smith, John Rawson	Bus.,'29	Elmira, N.Y.
Smith, Laird Edwin	Bus.,'31	Columbus, O.
Smith, Melchior Harry	Bus.,'30	Columbus, O.
Smith, Reginald Frank	Ch.E.,'29	Newport
Smith, Robert Clifford, Jr.	Eng.,'31	Shawnee-on-Delaware
Snavely, Benjamin Lichty	Phys.,'28	Lancaster
Snavely, Clarence Lichty	C.E.,'29	Lancaster
Snodgrass, Harlan Eskey, Jr.	Arts,'29	Summit, N.J.
Snyder, Jack Brennan	Arts,'29	Dubuque, Ia.
Snyder, Raymond Eugene	Eng.,'31	Semoyne
Snyder, William Harry, Jr.	Bus.,'31	Newport
Sobo, Leslie Milford	Arts,'31	Newark, N.J.
Solotwa, Stephen	E.E.,'29	Bethlehem
Solt, John Hagenbuch	E.E.,'29	Bethlehem
Somerville, John Jeffrey	Bus.,'30	Bethlehem
Sordon, Edward Preston	Eng.,'31	Riverton, N.J.
Sosa, Ricardo	E.E.,'29	Salta, Argentina
Sowers, Leon Knepper	E.E.,'29	Hagerstown, Md.
Spalding, George	Bus.,'28	Louisville, Ky.
Spangler, John Earl	C.E.,'30	York
Speck, Robert Edgar	I.E.,'30	Bethlehem
Spector, Sydney Marvin	Arts,'31	New York, N.Y.
Speicher, George James	C.E.,'28	Lebanon
Speirs, Thomas Clark	Arts,'31	New London, Conn.
Spiegelglass, Harold Lawrence	Arts,'31	Hackensack, N.J.
Sponsler, John Bernard	E.E.,'29	Williamsport

Sprecher, James Leithiser	E.E.,'29	Bethlehem
Sprinz, Bennett Strauss	Bus.,'31	New York, N.Y.
Squier, Edward Eugene, Jr.	Eng.,'31	East Orange, N.J.
Stabler, Donald Billman	C.E.,'30	Williamsport
Stabler, Robert Allen	Eng.,'31	Williamsport
Stack, Edward John	Arts,'31	Brooklyn, N.Y.
Stanton, Clement Francis	Ch.E.,'29	Mount Carmel
Starkey, William Paul, Jr.	Bus.,'28	Philadelphia
Staub, Edmund Arthur	Bus.,'30	Millburn, N.J.
Stauffer, Charles Richard	Bus.,'28	Bethlehem
Stauffer, Robert Henry	Bus.,'30	Leola
Stay, Charles Albert	E.E.,'29	Locust Valley, N.Y.
Steidle, William Jacob	Arts,'28	Jeddo
Steilen, Louis John	Eng.,'31	Brooklyn, N.Y.
Stein, Victor	Phys.,'30	East Orange, N.J.
Steiner, Bentley Otto	E.E.,'30	Belle Vernon
Steinmetz, Edward George, Jr.	Arts,'29	Wyncote
Sterner, Henry Allen	Ch.E.,'29	Pottsville
Stevenson, Frank Wallace, Jr.	E.E.,'29	Camden, N.J.
Stever, Earl Moyer	Eng.,'31	Bethlehem
Stewart, Colman Atkins	Arts,'31	Windsor, Conn.
Stewart, George Wilkinson	Arts,'31	Drexel Hill
Stieff, Forrest Samuel	Ch.E.,'28	Reiffton
Stiles, Bradford Willet	I.E.,'30	New York, N.Y.
Stirrett, William Robert	C.E.,'30	Philadelphia
Stocker, Raymond Eugene	E.E.,'30	Easton
Stone, Franklin Porter	E.E.,'29	Woodbury, N.J.
Stone, Richard Marvin	Arts,'29	Niagara Falls, N.Y.
Stoneback, John Harold	Arts,'30	Springtown
Storm, Thomas Franklin	I.E.,'30	Pottstown
Stow, Louis Jackson	Arts,'31	Merchantville, N.J.
Straub, Donald Benno	C.E.,'28	Pittsburgh
Strauss, Morton	Bus.,'31	Philadelphia
Strawn, Thomas Franklin	E.E.,'30	Quakertown
Stroman, Joseph Brobst	Arts,'31	Bethlehem
Strubbe, Frederick Herman, Jr.	Bus.,'30	Maplewood, N.J.
Stutz, Frank August	Eng.,'31	Washington, D.C.
Sudholz, Louis Henry	Ch.E.,'28	Brooklyn, N.Y.
Sulken, Herman	Arts,'30	Brooklyn, N.Y.

Sullivan, Arthur Alan	Bus.,'31	Tenafly, N.J.
Sussman, Louis	E.E.,'30	Allentown
Swallow, Arthur Albert	Arts,'28	Bryn Mawr
Swanger, Walter Abram	C.E.,'30	Lebanon
Swartz, Carl Jerome	Eng.,'31	York
Sweeny, Ross Fultz	Eng.,'31	Nutley, N.J.
Sweitzer, Albert James	M.E.,'28	Brooklyn, N.Y.
Sweitzer, Raymond Wendell	I.E.,'28	Philadelphia
Swinton, John	Arts,'28	Linden, N.J.
Sylvester, Robert Arthur	E.E.,'30	Pottsville
Talbert, Elmer Hughes	M.E.,'28	Washington, D.C.
Taylor, Gibson Dunlop	Bus.,'30	Syracuse, N.Y.
Taylor, Harold Lorne	Arts,'31	Portland, Me.
Taylor, Leonard Myron	Bus.,'30	Newark, N.J.
Taylor, Roger Schofield	E.E.,'29	Philadelphia
Teitelbaum, Nathan	Arts,'28	Jersey City, N.J.
TenEyck, Hugh Skillman	Eng.,'31	Somerville, N.J.
TenEyck, William Worley	Ch.E.,'30	Washington, D.C.
Thaeler, Charles Schropp	E.E.,'28	Nazareth
Thatcher, Samuel Harold, B.S. (*Moravian College*)	E.M.,'29	Bethlehem
Thom, George Boyd	M.E.,'28	Upper Darby
Thomas, David Pryse	Eng.,'31	Elmhurst
Thomas, Frank Martin	M.E.,'30	Bethlehem
Thomas, George Washington	Bus.,'30	Plymouth
Thomas, James Garfield, Jr.	I.E.,'30	Plymouth
Thomas, John	C.E.,'30	Pottsville
Thompson, Clarence Thomas	Bus.,'30	Morristown, N.J.
Thompson, Harry Louis	Bus.,'31	Montoursville
Thompson, Robert Farquharson	Bus.,'31	Bethlehem
Thornton, Arthur William, Jr.	Eng.,'31	McKeesport
Throckmorton, James Sansbury, III	Eng.,'31	Caldwell, N.J.
Ticehurst, William Harry	Eng.,'31	Tenafly, N.J.
Tiedeken, Theodore John Walton	Eng.,'31	Camden, N.J.
Tifft, Robert Lincoln	Bus.,'30	Brooklyn, N.Y.
Tillinghast, Frederick William	C.E.,'30	Baltimore, Md.

Toeplitz, William Richard	Eng.,'31	Irvington, N.J.
Toland, James Peter	Arts,'31	Mount Carmel
Tomlinson, Walter John, Jr.	Eng.,'31	Arlington, N.J.
Toth, Stephen Bella	Arts,'30	Bethlehem
Towle, Howard Colgate, Jr.	E.E.,'28	Quincy, Mass.
Townley, James Marcus	Eng.,'31	Ronceverte, W.Va.
Trabulsi, Kalil Paul	Bus.,'31	Brooklyn, N.Y.
Tracy, William Ward	Arts,'31	New York, N.Y.
Trantum, Leland Dewey	Bus.,'29	Brooklyn, N.Y.
Tremper, Everett Wesley	Eng.,'31	New Haven, Conn.
Troderman, David	Arts,'29	Dorchester, Mass.
Troland, Harry Creomer	Bus.,'29	Philadelphia
Trost, Henry John	M.E.,'30	Union City, N.J.
Trumbull, Albert Hanson	M.E.&I.E.,'28	New York, N.Y
Tucker, Frank Philip	M.E.,'30	Bernardsville, N.J.
Tunick, Arthur Mandel	Arts,'30	New York, N.Y.
Tunick, Milton Gordon	Arts,'31	New York, N.Y.
Turn, George Boyer	Bus.,'30	Scranton
Turner, Mason Edward	I.E.,'29	New York, N.Y.
Turner, Selwyn Horace	Bus.,'28	Mobile, Ala.
Twiggar, Edward Vernon	M.E.,'30	Shamokin
Tyler, Nathan Irving	Ch.E.,'28	Ridgewood, N.J.
Ullery, Richard Anderson	C.E.,'28	Pittsburgh
Underwood, Erwin Frederic	Arts,'31	Newport, R.I.
Urban, William John	Ch.E.,'29	Reading
Usher, Walter Scott	Bus.,'29	Union City, N.J.
Valeche, Maxwell Lloyd	Arts,'29	Brooklyn, N.Y.
Valenstein, Horace	Arts,'29	New York, N.Y.
Valentine, Weston Wightman	Eng.,'31	Kensington, Md.
VanBlarcom, Samuel Robert	E.E.,'29	Midland Park, N.J
Vandegrift, William B., Jr.	Arts,'31	Burlington, N.J.
VanFleet, Walter A.	C.E.,'28	Somerville, N.J.
VanHorn, Emery Lamartine	Eng.,'31	Sayre
VanHorne, Roger Harold	Ch.E.,'28	Philadelphia
VanKirk, William Keenan	Eng.,31	Elizabeth
VanNort, John Lincoln	E.E.,'28	Clark's Green
VanWinkle, Paul	Bus.,'29	Scarsdale, N.Y.
Vaughan, Daniel Caraker	E.E.,'28	Washington, D.C.
Vaughan, George Chandler	C.E.,'30	Washington, D.C.
Veale, Frank Read, Jr.	Arts,'31	Glenside

Ventre, Fred Vincent	C.E.,'29	Old Forge
Verrilli, Leonard Arthur	Ch.E.,'28	Harrison, N.Y.
Visco, Ralph Aloysius	Ch.E.,'29	Wood-Ridge, N.J.
Vogel, Nathan Edward	Arts,'28	New York, N.Y.
Vogeler, Theodore Winters	Eng.,'31	South Orange, N.J.
Voorhies, Andre Francis	E.E.,'29	Decatur, Ill.
Vreeland, James Philip, Jr.	Bus.,'31	Towaco, N.J.
Vroman, Guy Marston	Bus.,'30	Larchmont, N.Y.
Vroom, William Henry	E.E.,'30	Ridgewood, N.J.
Wachholtz, Walter Arthur	Ch.E.,'30	Hasbrouck Heights, N.J.
Wagner, Frederick Richard	Bus.,'31	Weehawken, N.J.
Wagner, Norman Warner	C.E.,'28	Norristown
Wagner, William Herman	Arts,'31	Milwaukee, Wis.
Wainewright, Clement Reeves	Eng.,'31	Philadelphia
Wainwright, Arthur John	Eng.,'31	Gravity, Ia.
Waite, Wilbur, Jr.	Bus.,'31	Loup City, Neb.
Walbert, David Eugene	E.E.,'30	Allentown
Waldman, Arthur	E.M.,'29	Philadelphia
Walker, Robert Woods	Ch.E.,'28	Little Rock, Ark.
Wallace, Jack David	Arts,'31	New York, N.Y.
Walsh, Joseph Russell	Eng.,'31	Somerville, N.J.
Walters, Sydney Delwin	Arts,'31	Trenton, N.J.
Waltman, Moses	Arts,'31	New York, N.Y.
Wanner, Louis Raimond	Eng.,'31	Philadelphia
Ward, Ralph Eugene, Jr.	Bus.,'29	Dalton
Ward, Robert Davis	C.E.,'30	Brooklyn, N.Y.
Wardle, Howard	C.E.,'29	Philadelphia
Waring, John Monroe	Arts,'31	Caldwell, N.J.
Warlow, Earnest Judson	C.E.,'29	Baltimore, Md.
Warner, Lyman Darling	E.E.,'28	Bryn Mawr
Warren, Walter Burgess, Jr.	Bus.,'31	West Newton, Mass.
Warwick, William Bond	Eng.,'31	Upper Darby
Waterman, John Anderson	M.E.,'30	Gary, Ind.
Watkins, Edgar George	E.M.,'28	Wilkes-Barre
Watson, Gerald Fleet	Eng.,'31	Newport
Wattenberg, Sidney William	Arts,'31	Brooklyn, N.Y.
Weaver, Harold Rowland	Arts,'31	Mohonk Lake, N.Y.
Weaver, Herbert Franklin, Jr.	Ch.E.,'28	Bethlehem
Webbe, Charles Edmunds	M.E.,'29	Summit, N.J.

Weber, Henry Ellis	Bus.,'30	Wrentham, Mass.
Weber, William Arthur	Arts,'30	Scranton
Weber, William H. A., Jr.	Eng.,'31	Maplewood, N.J.
Weierbach, Russell Mason	Arts,'29	Pleasant Valley
Weimar, Paul John	Eng.,'31	Philadelphia
Wein, Ellis	Bus.,'31	New York, N.Y.
Weiner, Louis	Arts.,'29	Malden, Mass.
Weiss, Clarence Carl	Eng.,'31	Scranton
Weiss, Edward Haring	E.E.,'30	Allentown
Weiss, Harold Kenneth, B.S. (*Moravian College*)	Met.,'29	Wilkes-Barre
Weiss, Herbert	Arts,'31	Brooklyn, N.Y.
Welch, Merrill Ernest	E.E.,'28	Bayonne, N.J.
Welliver, Harry Battin, Jr.	Eng.,'31	Hazleton
Welsh, John Alexander	Arts,'31	Harrisburg
Welsh, Robert Clark, Jr.	E.E.,'30	Harrisburg
Wenny, Daniel Herman, Jr.	Met.,'29	Orange, N.J.
Wentz, Charles Robert	Met.,'30	Duquesne
Wentzel, John Mark	C.E.,'30	Carlisle
Werft, August Rudolph	Eng.,'31	Altoona
Werley, Marvin Harold	M.E.,"28	Allentown
Werley, William Russell	Eng.,'31	Hamburg
Werner, Joseph Charles, Jr.	Ch.E.,'30	Hasbrouck Heights, N.J.
Wert, James VanAtta	Eng.,'31	Hackettstown, N.J.
Westcott, George Maurice	M.E.,'29	Scranton
Wesner, Ralph	Eng.,'31	Pottstown
Weysser, John Louis	Eng.,'31	Paxinos
Whaley, Frederick William	Bus.,'29	Buffalo, N.Y.
Wheeler, Homer Henderson	Arts,'31	Indianapolis, Ind.
Whims, Paul Lawrence	Eng.,'31	St. Clair
Whitaker, James Oscar	Ch.E.,'29	Branchville, N.J.
White, Roland Stedman	Bus.,'31	Suffield, Conn.
Whitehead, Ross	Eng.,'31	Pawtucket, R.I.
Whitney, Forrest Jerome, Jr.	E.E.,'30	Philadelphia
Whittock, William Baker	E.M.,'29	Hummelstown
Wick, John Borden	Arts,'31	Woodbury, N.J.
Wiegand, Ward Whitman	Bus.,'29	Hollis Gardens, N.Y.
Wiegner, James Robert	Eng.,'31	Bethlehem
Wiener, Robert Louis	Arts,'31	New York, N.Y.

Wiesner, August Joseph, Jr.	Arts,'29	Bergenfield, N.J.
Wiest, Horace Gotwalt	E.E.,'29	York
Wightman, John Edward, Jr.	E.E.,'29	Mount Carmel
Wilbur, Harry Packer, Jr.	Bus.,'30	New Bedford, Mass.
Wilcox, Chester Mitchell	Bus.,'30	Binghamton, N.Y.
Wilde, Norton Charles	Eng.,'31	New York, N.Y.
Wilkerson, Oscar Arthur, Jr.	Bus.,'31	Colonia, N.J.
Wilkinson, Charles Stewart	Arts,'29	Canton, O.
Wilkinson, Donald Elverson	Bus.,'31	Meriden, Conn.
Williams, Charles Edward	Eng.,'31	Yonkers, N.Y.
Williamson, Howard Ernest	Eng.,'31	Princeton, N.J.
Willis, Francis Macleod	C.E.,'28	Richmond, Va.
Wills, Walter Pennypacker	E.E.,'30	Philadelphia
Wilson, Donald Robert	Bus.,'28	Buffalo, N.Y.
Wilson, Harry Stephen	Eng.,'31	Brooklyn, N.Y.
Wilson, Lloyd Garrison	Arts,'30	New York, N.Y.
Wilson, Taylor Franklin	E.E.,'28	Bethlehem
Wilson, Walter Arthur	Bus.,'30	Richmond Hill, N.Y.
Wilson, Warren Elvin	C.E.,'28	Madison, N.J.
Wilson, William VanZandt, Jr.	Bus.,'28	Glen Ridge, N.J.
Winchester, Edward Stansbury	Bus.,'31	New York, N.Y.
Winegarner, Barr Gailard	I.E.,'29	Columbus, O.
Winkler, Walter Frederick,	Eng.,'31	Ramsey, N.J.
Winters, James Edward	Bus.,'28	Jamestown, N.Y.
Wise, Edward, Jr.	Bus.,'30	St. Louis, Mo.
Witty, Sidney Herbert	Bus.,'31	New York, N.Y.
Wolfe, Samuel Melville, Jr.	Arts.,'29	Wilkes-Barre
Wolfe, Theodore Allen	Eng.,'31	Elmhurst
Woll, Carl Richard	Chem.,'30	Philadelphia
Woltemate, Albert William, Jr.	Arts,'31	Philadelphia
Wood, Adriance Howland	Arts,'31	New Rochelle, N.Y.
Woodring, Philip Wendell	C.E.,'29	Allentown
Woodward, Dean Pursell	Arts,'31	Allentown
Woodward, John Detwiler	E.E.,'30	Bala-Cynwyd
Wooley, Joseph Addison, Jr.	Bus.,'31	Forest Hills, N.Y.
Worthington, William Sabin	Arts,'31	Salt Lake City, Utah
Wright, Craig LaSalle	Bus.,'28	Hempstead, N.Y.

Wright, Donald Lynd	M.E.,'30	Philadelphia
Wright, Quentin Stanley	Arts,'29	Neponsit, N.Y.
Wright, Walter Parry, Jr.	Eng.,'31	Richmond, Va.
Writer, VanModina	Bus.,'31	Nyack, N.Y.
Wyckoff, Barkley, Jr.	Arts,'31	Glen Ridge, N.J.
Wyckoff, Elmer Ellsworth, Jr.	Bus.,'30	Washington, N.J.
Wyckoff, Frederick Albert, Jr.	Arts,'31	New York, N.Y.
Wynkoop, William	E.E.,'29	Scranton
Yeager, Willis Theodore	M.E.,'29	Allentown
Young, Farrar	Bus.,'31	Ridgway
Young, Norman Spaulding	I.E.,'28	Huntington, N.Y.
Young, Philip Sullivan	Bus.,'31	Wellsboro
Youngken, Henry Christian	E.E.,'30	Bethlehem
Zabriskie, Frederick Nathaniel	Eng.,'31	North Hackensack, N.J.
Zakorka, Zigman Walter	Eng.,'31	Scranton
Zearley, James Paul	C.E.,'29	Uniontown
Zeaser, John Edward	E.E.,'30	Catasauqua
Zeigler, Albert Howard	Ch.E.,'30	Norristown
Zenitz, Julian Leon	I.E.,'30	Baltimore, Md.
Zerbe, John Addison	Bus.,'28	Reading
Zerweck, Richard	E.E.,'28	Bethlehem
Zimmer, Harry John	M.E.,'30	Philadelphia
Zimmerman, Philip Marx	I.E.,'29	Brooklyn, N.Y.
Zipser, James Alexander	C.E.,'30	New York, N.Y.
Zoble, Robert	Bus.,'31	Trenton, N.J.
Zuhlke, Robert Spencer	Bus.,'31	New York, N.Y.

STUDENTS IN SATURDAY CLASSES

Haslet, Alice Elisabeth	Easton

SUMMER SESSION, 1927

Accardi, Alessio John	Wildwood, N.J.
Adams, William Brackenridge	Crafton
Aitken, Donald Guthrie	Orange, N.J.
Albright, Ralph John	Allentown
Auten, John Hawkins	Corbett, Md.
Bachman, Charles Russell	Upper Montclair, N.J.
Bahr, Paul Albert	Scranton
Baker, Harold Jay, Jr.	Tulsa, Okla.
Baker, Hyman	Wildwood, N.J.
Baldwin, Donald William	Philadelphia
Barker, Frederick Simon	Bridgeton, N.J.
Barnes, Horace Allan	Philadelphia
Barnitz, Edward Switzer	Salem, Va.
Barrows, Daniel Joseph	New York, N.Y.
Bauder, Erwin H.	Hellertown
Bauer, Charles Henry, Jr.	East Orange, N.J.
Bean, Henry Detwiler	Skippack
Bechtel, Josephyne Adams	Pottsville
Becker, Lewis William, Jr.	Trenton, N.J.
Beckman, George William	Hellertown
Beers, Stanley Stephen, B.S. (*Temple University*)	Walnutport
Bender, Luther Huyett	Wernersville
Benner, Roland George	Quakertown
Bent, Joseph Grant, Jr.	Baltimore, Md.
Benton, Forest Theodore, Jr.	Somerville, Mass.
Bertolet, Benneville Stephen	Bethlehem
Bieth, Chester Xavier	Brooklyn, N.Y.
Blackmar, John Milton	East Orange, N.J.
Blackmar, William Edgar	East Orange, N.J.
Bloom, Louis Morris	Philadelphia
Bogerman, Frank Carter	Paterson, N. J.
Bohner, John Allen	Catasauqua
Bollman, Michael Joseph	Lebanon
Bossard, Frank Edgar	Phillipsburg, N.J.

Boyer, Lee Calvin	Shamokin
Brader, James Clarence	Nanticoke
Brady, Joseph Skeath, Jr.	Bayonne, N.J.
Brick, Robert Maynard	Atlantic City, N.J.
Briggs, Milton Alver	Bradley Beach, N.J.
Bronstein, Jesse Bayliss, Jr.	Allentown
Brosz, Paul Albert	Philadelphia
Brower, Theron Emmett	Little Silver, N.J.
Brown, Earl Harris, B.S. (*Pennsylvania State College*)	Slatington
Buck, Louis Augustine	Bethlehem
Buck, Walter Stephen	Bethlehem
Budd, Hulse	Budd Lake, N.J.
Bullard, Dexter	Kew Gardens, N.Y.
Burger, Dallas Osville	Allentown
Burkhart, Louis Hoddle, Jr.	Warren
Bush, Rudolph Myers	Washington, D.C.
Campbell, William	Fullerton
Caskey, Joseph Ralph	Philadelphia
Cassone, Vincent James	Allentown
Castle, Jesse Greenman	Lockport, N.Y.
Castles, Hugh Witherow	Mechanicsburg
Chance, Isobel Hull	Bethlehem
Chandler, Thompson	New York, N.Y.
Cherry, Franklin Willard	Ringtown
Chiodo, Leon Joseph	Dunmore
Christman, Carl Mertz	Sinking Springs
Christman, Miles Shelly	Trumbauersville
Citron, Millard Herman	White Plains, N.Y.
Clarke, Davison Randolph, III	Freemansburg
Clegg, Charles Vickers	Narberth
Coates, Stephen Paul	Brooklyn, N.Y.
Collins, Charles Frederick	Bethlehem
Conneen, John Kearney	Maplewood, N.J.
Connell, Valentine Barker	Audubon, N.J.
Conrath, Joseph George	Erie
Converse, Curtis Vaughn	Athens
Cooper, Frank Edward	Shamokin
Cooper, George Mullen	Sewickley
Cope, Samuel Frederick	Bethlehem

Corcoran, Gerald Aloysius	Scranton
Covey, John Knox	Coudersport
Coxe, Thomas Herbert Carey	Bethlehem
Craft, Edmund Coleman	Pennington, N.J.
Crewe, Leonard Carter, Jr.	Gary, Ind.
Curtin, John, Jr.	Bellefonte
Dagostin, Frank Vincent	Sugarloaf
Dailey, John Woodward	Philadelphia
Daily, Kathryn Frances	Bethlehem
Danko, Joseph Thomas	McKeesport
Datwyler, Howard Edward	Flushing, N.Y.
Davey, John Roderick	Mansfield, O.
Davis, Melvin Edmund	New London, Conn.
Deckard, Ralph Herman	Marysville
DeHuff, Gilbert Lafayette, Jr.	Millville, N.J.
Deischer, Claude Knauss	Emaus
DeMattia, Lawrence	Passaic, N.J.
DeMoyer, Robert	Camden, N.J.
Dickerson, Julian Douglas	Washington, D.C.
Didden, Clement Albert	Washington, D.C.
Diener, Earl William	Allentown
Dillon, Jeremiah Vincent	New London, Conn.
Dixon, William Vincent	Bethlehem
Dorsett, George Chesley	Garwood, N.J.
Dorsey, William Herman	New Britain, Conn.
Dotter, Harold Kleist	Carlisle
Dow, Alan Wayne	Brookline
Dow, James Neal	Philadelphia
Downes, Martha	Wharton, N.J.
Dunn, Harvey Hopkins, Jr.	Philadelphia
Dunn, William Hurley	Park Ridge, N.J.
Dwyer, Mary Margaret, B.S. (*Moravian College for Women*)	Bethlehem
Earhart, Kenneth Allen	Avonmore
Ebert, Michael Smyser	Wilmington, Del.
Eckrote, Kenneth Richard	Conyngham
Eisenbrown, Paul Daniel	Reading
Eisenhard, John Luther, B.A. (*Muhlenberg College*)	Topton
Ellis, Ralph	Ridgewood N.J.

Emery, Walter Earl	Mount Bethel
Emhardt, Frederick William	Philadelphia
Epstein, David William	Bethlehem
Ernst, George Gilbert	Wilkes-Barre
Evans, John Powell	Freeland
Falcone, Anthony	Roseto
Fauth, Harry Roosevelt	York
Favinger, Stanley Louis	Philadelphia
Fenstermacher, Guy Marvin	Telford
Feucht, Robert	Lambertville, N.J.
Findon, Brent Ernest	Bethlehem
Fine, Albert Hollister	Nanticoke
Fine, Isadore	Baltimore, Md.
First, John Yousling	Bethlehem
Fischer, Louis Chapman	Freeport, N.Y.
Fiscus, David Homer	National City, Cal.
Fletcher, Theodore Francis	Philadelphia
Fopeano, Joseph Ellsworth, B.S. (*Susquehanna University*)	Middleburg
Fry, William Rawlings	New York, N.Y.
Fullagar, John Wotring	Catasauqua
Fulmer, John Edward	Bethlehem
Gadd, Robert Foster, Jr.	Hartford, Conn.
Gans, Henry Bateman, Jr.	Uniontown
Garrison, John Hazlett	Pittsburgh
Geisenderfer, Paul Frederick	Bethlehem
George, Ruel Billings	Tunkhannock
Gerber, Madalene Wilma	Bethlehem
Gery, Thomas Kramer	Allentown
Gettys, Paul Eugene	Harrisburg
Gilbert, DeWitt Cromwell	Hackensack, N.J.
Giordano, Emilio	New York, N.Y.
Girdler, Joseph Hayes	Pittsburgh
Goldblatt, Nathaniel Rome	Reading
Goodwin, Kenneth Wade	Millville, N.J.
Gordon, Alexander Robert	Ocean City, N.J.
Gott, Edwin Hays	Pittsburgh
Goudy, William Leonard	Glen Ridge, N.J.
Gould, William	Brooklyn, N.Y.
Grady, Lester Dewar, Jr.	Caldwell, N.J.

Granacher, Charles Willard	Scranton
Greenstein, Charles Edward	Suffern, N.Y.
Griffith, Arthur Franklin	Catasauqua
Griffith, David Pendril	Catasauqua
Grim, John Marshall, B.A. (*Franklin & Marshall College*)	Catasauqua
Grim, Mark Dismant	Kutztown
Grimes, Howard Becker	Womelsdorf
Guerrero, Luis Francisco	Cucuta, Colombia
Gummere, Rebecca	Bethlehem
Gunthorp, Thomas Lloyd	Philadelphia
Haas, Charles Francis	Mazatlan, Sinaola, Mexico
Haehnle, Florence	Bethlehem
Hammond, Henry Sweitzer	Bethlehem
Hansen, William Knox Wilson	Penn
Harley, Dudley Lee	Martinsburg, W.Va.
Hartung, George Hazlette	Phillipsburg, N.J.
Harwood, Thomas James, Jr.	East Islip, N.Y.
Haviland, Douglas Jones	Hillside, N.J.
Hawkins, Thane Edwin	Harrisburg
Hayward, Henry George August	Bridgeport, Conn.
Hebbard, George Miller	Washington, D.C.
Heil, Wilbur Samuel	Allentown
Heilman, James Martin	Harrisburg
Heilman, William Milton	Kittanning
Heilman, William Owen	Harrisburg
Heller, Robert Saul	Philadelphia
Henry, Andrew Max	Augusta, Ga.
Herbruck, Robert Ashton	Dayton, O.
Herman, Lester Carl	Easton
Hewitt, James Richard, Jr.	Baltimore, Md.
Hewitt, Leslie Randall	Ocean View, N.J.
Hickey, Frances	Bethlehem
Hickman, Paul	Arlington, N.J.
Hires, Benjamin Franklyn	Roadstown, N.J.
Hobbs, Herbert Clarence, Jr.	Brooklyn, N.Y.
Hodge, Louisa A.	Bethlehem
Hoehn, Walter George	Bogota, N.J.
Holstein, Earl	Pottsville

Holtz, Jehiel	Brooklyn, N.Y.
Hopkins, Zebulon Corbin	Dover, Del.
Horgan, Andrew Bothwell	Orange, N.J.
Horvath, Paul Joseph	Bethlehem
Hottinger, Edwin Jack	Kenvil, N.J.
Hubbard, George Earle, B.A. (*Oberlin College*)	Bethlehem
Hunt, George Edward	East Orange, N.J.
Huntoon, Calvin Brewer	Swarthmore
Hurley, Richard Wilton	Belmar, N.J.
Illick, Joseph Edward	Bethlehem
Inaba, Minoru	Kobe, Japan
Inglis, John Scott	Scranton
Isaacson, Carl	New York, N.Y.
Jeffries, Joseph, Jr.	Hollis, N.Y.
Johnson, Florence Agnes	Bethlehem
Johnson, John Edwin	Collegeville
Johnson, Katharine Mae	Bethlehem
Jones, Edward Jackson	Harford
Jones, Lyle Laughlin, Jr.	Greensburg
Jordan, Lester Earl	Allentown
Karr, Raymond Arthur	Haddon Heights, N.J.
K'Burg, Richard Bauman	Forty Fort
Keller, Harry Summy, Jr.	Bloomsburg
Kelly, William Dunham, II	Philadelphia
Kennedy, Verna, Ph.B. (*Muhlenberg College*)	Allentown
Kidder, Calvin Parsons	Forty Fort
King, Charles Preston John	West Catasauqua
Kistler, Ruth Moser, A.B. (*Ursinus College*)	Allentown
Klein, Louis	Bethlehem
Klein, Wilson Goodwin	Irvington, N.J.
Kline, Robert Patterson	Fairmont, W.Va.
Knecht, John Elmer	West Collingswood, N.J.
Koehler, Carl Jacob	Pleasantville, N.J.
Koller, Gertrude	Bethlehem
Kratz, Philip	Bethlehem
Kreidler, Carl Lester	Bethlehem
Kricker, William Mathias	Sparrows Point, Md.

Kuchinski, Frank Edwin	Minooka
Kuck, George Justus	Forest Hills, N.Y.
Kuntz, Stephen Albert	Allentown
Lambert, Beulah Florine	Bethlehem
Landis, Arthur Clair, Jr.	Hamburg, Germany
Laramy, Robert Edward, Jr.	Altoona
Latimer, Floyd	High Bridge, N.J.
Latremore, Robert Francis	West Orange, N.J.
Latsha, Milton Paul	Shamokin
Lawrence, Edward Morris	Salem, N.J.
Lentz, Robert Pierce, Jr.	Eggertsville, N.Y.
Leonard, Joseph Claver	South Fork
Lerch, Franklin Stuart, B.A. (*Lehigh University*)	Freemansburg
Lerch, Russell Otterbein	Palmyra
Lesh, Stogdell Stokes	South River, N.J.
Letowt, Zigmont Joseph, Jr.	Hazleton
Lewis, Alvin Bower	Bethlehem
Lewis, Robert Beckwith	Bethlehem
Lincoln, Robert James	East Orange, N.J.
Longstreet, Robert Louis	Asbury Park, N.J.
Loomis, Francis Earl	Jamaica, N.Y.
Lorsbach, Elizabeth Mary, Ph.B. (*Muhlenberg College*)	Allentown
Lynn, George Randal, Jr.	Pottsville
Lynn, Harold William	Bethlehem
Lyter, John Alfred	Harrisburg
MacCalla, Willard Arrison	Youngstown, O.
MacGillis, Donald John, Jr.	Jacksonville, Fla.
McAlarney, John Charles, Jr.	Plymouth
McClarin, Robert Taylor	Philadelphia
McClaskey, George Arthur	Canton, O.
McCreedy, Mary Benedicta	Bethlehem
McLaughlin, Conrad	Philadelphia
McLeod, Donald Spence	Elmira, N.Y.
McWilliams, Herbert Gladstone	Duquesne
Macgeorge, William Dean	Vineland, N.J.
Maddock, Joseph Gaynor	Phillipsburg, N.J.
Maier, Curtis Eugene	Allentown
Manner, Richard Jacob	Bethlehem

Many, Robert Howland, Jr.	Bayonne, N.J.
Marsh, Alva VanRensselaer	Baltimore, Md.
Messersmith, Harry Edgar, A.B., A.M. (*Albright College*)	Allentown
Michael, Henry Edward	Havre de Grace, Md.
Midlam, Edward West, Jr.	Philadelphia
Miller, Bertram Nicholas	Elizabeth, N.J.
Miller, John Zollinger	Harrisburg
Miller, Luther Jacob Calvin	Allentown
Minner, Fred Henry, B.S. (*Muhlenberg College*)	Allentown
Mittendorf, Edward Max	Barmen, Germany
Moore, Ralph Calvert	Berkeley, Cal.
Morrison, Bruce	Stamford, Conn.
Motz, Houston O.	Hendersonville, N.C.
Moyer, George Weldon	Souderton
Mueller, Wesley William Samuel	Maplewood, N.J.
Munson, Alexander Lawrence	Brooklyn, N.Y.
Myer, J. Leland	Leola
Naylor, Fred Claus	Bethlehem
Neumann, George Julius	Allentown
Newhard, Henry Thomas	Fullerton
O'Connell, John Charles, Jr.	Hagerstown, Md.
Ogden, Gordon Prentiss	Great Neck, N.Y.
Oller, George Ellis, Jr.	Philadelphia
Opp, George Sandt	Philadelphia
Ortlip, William Marshall	Oxford
Oswald, Charles Tilghman	Fullerton
Ott, Arthur Roland	Coopersburg
Ott, Frank Wesley	Allentown
Otten, Kenneth Peshan, A.B., B.D., S.T.M. (*Roanoke College, Philadelphia Lutheran Seminary*)	Bethlehem
Ovens, William George	Endicott, N.Y.
Overfield, Budd	Bethlehem
Owen, Elmer Bradshaw	Mickleton, N.J.
Paget, Francis King	Flushing, N.Y.
Pailey, Louis	Williamstown
Patterson, George McKeown	Philadelphia
Pelliciotti, Anthony	Berwyn

Pfaffhausen, Arnold Charles	Union City, N.J.
Pfeiffer, Helen Lucille	Corning, N.Y.
Pietzsch, Arthur Richard	Philadelphia
Pole, Harry Daingerfield, Jr.	Parr, S.C.
Pollitt, William Joseph	Bridgeport, Conn.
Potter, Frank Graham	Rockville Center, N.Y.
Powell, William Frederick, Jr.	Philadelphia
Pratt, Henry Gilbert, Jr.	Washington, D.C.
Pratt, Riley	Baltimore, Md.
Price, Thomas Edward	Plains
Purvis, Charles Shelton	Freeport, N.Y.
Quesada, Russell Lorenzo Shepherd	Havana, Cuba
Randall, David Anton	Shamokin
Raup, Richard Greer	Ocean City, N.J.
Reece, John Paul	Parkersburg, W.Va.
Refowich, Harold Girard	Bethlehem
Reill, James Bertrand	Scranton
Reinoehl, John Chaney	Philadelphia
Reynolds, Graham Peter	Bethlehem
Rice, Sears Baldwin	Mahwah, N.J.
Ritter, Reginald James	Bethlehem
Ritter, William Ray	Mechanicsburg
Roberts, Arthur Llewellyn, Jr.	Canton, O.
Roberts, William Edward	Slatington
Robinson, Malcolm Weeks	Bethlehem
Rohrs, Henry	Ridgewood, N.J.
Romig, Harold Herbert	Reading
Rosenson, Arthur	Brooklyn, N.Y.
Rozelle, Arlington Laverne	Carbondale
Ruth, Verna Viola, B.A. (*Moravian College for Women*)	Allentown
Ryerson, Carl George Walter	Brighton Heights, N.Y.
Salmon, William Messinger	Stanhope, N.J.
Salzenberg, Walter Henry	Woodcliff-on-Hudson, N.J.
Scandale, James Samuel	Old Forge
Scavo, James Anthony	Old Forge
Scavo, Joseph Phillip	Old Forge
Schaffer, Paul Samuel	Fullerton
Schell, John Carl	Robesonia

Schenck, Robert Faust, Jr.	Chicago, Ill
Schermer, Isadore	Bethlehem
Schickedanz, August Ernest	Hillside, N.J.
Schier, Oscar Bernhardt	Baltimore, Md.
Schilling, Murray Courtwright	Clark's Summit
Schmertz, Carolyn Marie	Atlantic City, N.J.
Schmertz, Elizabeth Keswick	Atlantic City, N.J.
Schmidt, Joseph Albert	Wilkes-Barre
Schultz, Manuel	Jamaica, N.Y
Schumaker, Frederick Lebbens	Philadelphia
Schweickardt, Anton Philip Charles	Pittsburgh
Schwitter, Charles Martin	Montclair, N.J.
Scott, Norris Alexander, Jr.	Moylan Rose Valley
Seaton, Wesley Hughes	Oil City
Secor, Andrew Reynolds	Ossining, N.Y.
Semar, Harold Walls	Philadelphia
Serber, Robert Frankel	Philadelphia
Seward, Harold Aloysius	Parkersburg, W.Va.
Sharp, John Paul	Hackettstown, N.J.
Sheets, Kenneth Enders	Enola
Shenton, Howard Francis	Slatington
Shimer, Johnston Bitler	Wilmington, Del.
Sickler, Richard Carl	Wilkes-Barre
Singer, Harry Frederick	Jermyn
Smith, Allen Edwin	Allendale, N.J.
Smith, Douglas Malcolm, B.A. (*Lehigh University*)	Bethlehem
Smith, Ephriam Koch	Swarthmore
Smith, Reginald Frank	Newport
Snodgrass, Harlan Eskey, Jr.	Summit, N.J.
Snyder, James Douglass, III	Frostburg, Md.
Spangler, John Earl	York
Speck, Robert Edgar	Bethlehem
Stabler, Donald Billman	Williamsport
Stanton, Clement Francis	Mount Carmel
Stauffer, Charles Richard	Bethlehem
Stearns, Charles Lewis	New York, N.Y.
Stein, Victor	East Orange, N.J.
Sterner, Henry Allen	Pottsville
Stieff, Forrest Samuel	Reiffton

Stiles, Bradford Willet	New York, N.Y.
Stirrett, William Robert	Philadelphia
Stocker, Raymond Eugene	Easton
Straub, Donald Benno	Pittsburgh
Strawn, Thomas Franklin	Quakertown
Strubbe, Frederick Herman, Jr.	Maplewood, N.J.
Sudholz, Louis Henry	Brooklyn, N.Y.
Sullivan, Neil Joseph	Philadelphia
Sweeney, Mary Evans	Allentown
Sylvester, Robert Arthur	Pottsville
Thomas, Frank Martin	Bethlehem
Thomas, James Garfield, Jr.	Plymouth
Thomas, John	Pottsville
Thompson, Robert Farquharson	Bethlehem
Tijerino, Cesar Dardanios	Espirito Santo, Nicaragua
Toadvine, George Henry	Williamsport
Trost, Henry John	Union City, N.J.
Tucker, Frank Philip	Bernardsville, N.J.
Tull, Richard	Fanwood, N.J.
Turn, George Boyer	Scranton
Turner, Mason Edward	New York, N.Y.
Twiggar, Edward Vernon	Shamokin
Ueberroth, Florence Scholl	Bethlehem
Urban, William John	Reading
VanBilliard, Charles Adam	Bethlehem
VanFleet, Walter A.	Somerville, N.J.
VanKeuren, Edwin, B.A. (*Lehigh University*)	Bethlehem
Ventre, Fred Vincent	Old Forge
Verrilli, Leonard Arthur	Harrison, N.Y.
Visco, Ralph Aloysius	Wood Ridge, N.J.
Voigt, Arno A.	Hawley
Vroom, William Henry	Ridgewood, N.J.
Waldman, Arthur	Philadelphia
Walker, Mabelle Stuart, A.B. (*Moravian College for Women*)	Wytheville, Va.
Walker, Robert Woods	Little Rock, Ark.
Ward, Robert Davis	Brooklyn, N.Y.
Wardle, Howard	Philadelphia

Waring, John Monroe	Caldwell, N.J.
Warlow, Earnest Judson	Baltimore, Md.
Watkins, Edgar George	Wilkes-Barre
Watson, Gerald Fleet	Newport
Weaver, Herbert Franklin	Bethlehem
Weaver, Paul Lawrence	Dryden, N.Y.
Weiss, Edward Haring	Allentown
Weiss, Harold Kenneth, B.S. (*Moravian College*)	Wilkes-Barre
Wenny, Daniel Herman, Jr.	Orange, N.J.
Wescott, George Maurice	Scranton
Whims, Paul Laurence	St. Clair
Whitaker, James Oscar	Branchville, N.J.
White, Roland Stedman	Suffield, Conn.
Whitney, Forrest Jerome, Jr.	Philadelphia
Whittock, William Baker	Hummelstown
Wightman, John Edward, Jr.	Mount Carmel
Wills, Walter Pennypacker	Philadelphia
Wilson, Lloyd Garrison	New York, N.Y.
Wilson, Muriel Louise, A.B. (*Moravian College for Women*)	Bethlehem
Wilson, William VanZandt, Jr.	Glen Ridge, N.J.
Wolfe, Samuel Melville, Jr.	Wilkes-Barre
Woodring, Philip Wendell	Allentown
Woodward, John Detwiler	Bala-Cynwyd
Wotring, Frances Adelia	Nazareth
Wright, Craig LaSalle	Hempstead, N.Y.
Wright, Donald Lynd	Philadelphia
Wyckoff, Elmer Ellsworth, Jr.	Washington, N.J.
Wynkoop, William	Scranton
Youngken, Henry Christian	Bethlehem
Zearley, Paul James	Uniontown
Zeaser, John Edward	Catasauqua
Zerbe, John Addison	Reading
Zimmer, Harry John	Philadelphia
Zipser, James Alexander	New York, N.Y.

SUMMARY OF STUDENTS BY CLASSES AND CURRICULA

Undergraduates	Seniors	Juniors	Sophomores	Freshmen	Special Students	Total
Arts and Science.......	47	67	85	155	2	356
Business Administration.	50	62	100	145	2	359
Chemical Engineering...	24	30	24	...	.	78
Chemistry	2	1	5	...	.	8
Civil Engineering.......	41	35	49	...	.	125
Electrical Engineering..	37	48	54	...	.	139
Engineering Physics....	1	3	5	...	.	9
Industrial Engineering..	15	19	24	...	.	58
Mechanical Engineering.	19	13	33	...	.	65
Metallurgical Engineering	1	10	11	...	.	22
Mining Engineering.....	9	10	7	...	.	26
Freshman Engineering..	..	..	..	270	2	272
Total	246	298	397	570	6	1517

Graduate Students	48
Undergraduates	1517
Special Student in Saturday Classes...............	1
Students in Summer Session, 1927................	447
Total, less duplications	1647

GEOGRAPHICAL DISTRIBUTION OF STUDENTS, 1927-1928

Alabama	2
Arkansas	1
California	2
Connecticut	44
Delaware	4
District of Columbia	22
Florida	6
Georgia	2
Illinois	6
Indiana	5
Iowa	2
Kansas	1
Kentucky	3
Maine	2
Maryland	43
Massachusetts	26
Michigan	5
Minnesota	2
Missouri	2
Nebraska	1
New Jersey	311
New York	290
North Carolina	2
Ohio	26
Oklahoma	2
Pennsylvania	787
Rhode Island	3
South Carolina	1
Texas	2
Utah	1
Virginia	8

West Virginia	14
Wisconsin	1
Alaska	1
Argentina	1
Canada	3
China	1
Colombia	1
Costa Rica	1
Cuba	2
Germany	2
Japan	1
Mexico	1
Nicaragua	1
Peru	1
Porto Rico	1
Siam	1
Total	1647

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